H. M. Ullmann.

p. 65
Smith 56 r. 7 in 1st Sem. + Chem 38 [illegible]
p. 111. Math 5 [illegible]

Genl. Ch 56 in Genl. 3 + 6 for B.S. in Chem
r in 1st semester

p. 114 - new listing for Dyeing [illegible]

H Williams

Lehigh University Publication

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REGISTER, 1929-1930

ANNOUNCEMENT, 1930-1931

BETHLEHEM

PENNSYLVANIA

1929

JULY

S	M	T	W	T	F	S
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1930

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1931

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UNIVERSITY CALENDAR

1929–1930

1929	
Sept. 5, 6, 7, 9 (Thurs.-Mon.)	Examinations for admission
Sept. 10, 11, 12, 13, 14 (Tues.-Sat.)	Freshman Week
Sept. 10, 11, 12, 13, 14 (Tues.-Sat.)	Fall re-examinations
Sept. 11, 3:30 p.m. (Wed.)	First Faculty meeting
Sept. 16, 17, 18 (Mon., Tues., Wed.)	Undergraduate registration
Sept. 18, 3:30 p.m. (Wed.)	**First Semester begins**
Sept. 21 (Sat.)	Graduate registration
Sept. 30 (Mon.)	Last day for undergraduate registration
Oct. 2 (Wed.)	Founder's Day (holiday)
Oct. 12 (Sat.)	Last day for graduate registration
Nov. 14 (Thurs.)	Mid-semester reports
Nov. 23 (Sat.)	Lafayette game (holiday)
Nov. 27, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Dec. 2, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 21, 12:00 m. (Sat.)	Christmas holidays begin
1930	
Jan. 6, 7:45 a.m. (Mon.)	Christmas holidays end
Jan. 18, 12:00 m. (Sat.)	Instruction ends
Jan. 20, 8.00 a.m. (Mon.)	Examinations begin
Jan. 29, 6:00 p.m. (Wed.)	**Examinations end**
Jan. 31, Feb. 1 (Fri., Sat.)	Registration days
Feb. 3, 7:45 a.m. (Mon.)	**Second Semester begins**
Feb. 8 (Sat.)	Graduate registration
Feb. 13 (Thurs.)	Last day for undergraduate registration
Feb. 22 (Sat., Washington's Birthday, Mid-Winter Alumni Day)	Public Speaking Contest
March 1 (Sat.)	Last day for graduate registration
April 3 (Thurs.)	Mid-semester reports
April 16, 4:00 p.m. (Wed.)	Easter holidays begin
April 24, 7:45 a.m. (Thurs.)	Easter holidays end
May 19, 20, 21 (Mon.-Wed.)	Senior Comprehensive Examinations
May 21, 12:00 m. (Wed.)	Instruction ends
May 22, 8:00 a.m. (Thurs.)	Examinations begin
May 31, 6:00 p.m. (Sat.)	**Examinations end**
June 2 (Mon.)	Surveying Camp begins
June 5, 6 (Thurs., Fri.)	Senior re-examinations
June 7 (Sat.)	Alumni Day
June 8 (Sun.)	Baccalaureate Sunday
June 9 (Mon.)	Class Day
June 10 (Tues.)	**University Day**
June 11, 12, 13, 14 (Wed.-Sat.)	Examinations for admission
June 28 (Sat.)	Surveying Camp ends
June 30 (Mon.)	Summer Session begins
Aug. 9 (Sat.)	Summer Session ends

UNIVERSITY CALENDAR—Continued

1930–1931

1930	
Sept. 4, 5, 6, 8 (Thurs.-Mon.)	Examinations for admission
Sept. 9, 10, 11, 12, 13 (Tues.-Sat.)	Freshman Week
Sept. 9, 10, 11, 12, 13 (Tues.-Sat.)	Fall re-examinations
Sept. 10, 3:30 p.m. (Wed.)	First Faculty meeting
Sept. 15, 16, 17 (Mon., Tues., Wed.)	Undergraduate registration
Sept. 17, 3:30 p.m. (Wed.)	**First Semester begins**
Sept. 20 (Sat.)	Graduate registration
Sept. 29 (Mon.)	Last day for undergraduate registration
Oct. 1 (Wed.)	Founder's Day (holiday)
Oct. 11 (Sat.)	Last day for graduate registration
Nov. 13 (Thurs.)	Mid-semester reports
Nov. 22 (Sat.)	Lafayette game (holiday)
Nov. 26, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Dec. 1, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 20, 12:00 m. (Sat.)	Christmas holidays begin
1931	
Jan. 5, 7:45 a.m. (Mon.)	Christmas holidays end
Jan. 17, 12:00 m. (Sat.)	Instruction ends
Jan. 19, 8:00 a.m. (Mon.)	Examinations begin
Jan. 28, 6:00 p.m. (Wed.)	**Examinations end**
Jan. 30, 31 (Fri., Sat.)	Registration days
Feb. 2, 7:45 a.m. (Mon.)	**Second Semester begins**
Feb. 7 (Sat.)	Graduate registration
Feb. 12 (Thurs.)	Last day for undergraduate registration
Feb. 21 (Sat., Washington's Birthday, Mid-winter Alumni Day)	Public Speaking Contest
Feb. 28 (Sat.)	Last day for graduate registration
March 26 (Thurs.)	Mid-semester reports
April 1, 4:00 p.m. (Wed.)	Easter holidays begin
April 9, 7:45 a.m. (Thurs.)	Easter holidays end
May 18, 19, 20 (Mon.-Wed.)	Senior Comprehensive Examinations
May 20, 12:00 m. (Wed.)	Instruction ends
May 21, 8:00 a.m. (Thurs.)	Examinations begin
May 30, 6:00 p.m. (Sat.)	**Examinations end**
June 1 (Mon.)	Surveying Camp begins
June 4, 5 (Thurs., Fri.)	Senior re-examinations
June 6 (Sat.)	Alumni Day
June 7 (Sun.)	Baccalaureate Sunday
June 8 (Mon.)	Class Day
June 9 (Tues.)	**University Day**
June 10, 11, 12, 13 (Wed.-Sat.)	Examinations for admission
June 27 (Sat.)	Surveying Camp ends
June 29 (Mon.)	Summer Session begins
Aug. 8 (Sat.)	Summer Session ends

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Instructor in Electrical Engineering

ARTHUR RICHARD BRAUNLICH, JR., A.B., A.M.
Instructor in English

WILLIAMS BASSETT GETCHELL, JR., B.S. IN C.E.
Instructor in Civil Engineering

THOMAS HUGER HAZLEHURST, JR., A.B., PH.D.
Instructor in Chemistry

CARLETON FRANCIS MAYLOTT, B.S. IN E.E.
Instructor in Electrical Engineering

DAVID GALLUP SCOTT, B.A., M.A.
Instructor in Romance Languages

JONATHAN BURKE SEVERS, A.B., A.M.
Instructor in English

GEORGE DORMER FARNE, A.B., M.A.
Instructor in Romance Languages

GEORGE ALVIN FINCH, B.A., M.A.
Instructor in English

LELAND SPENCER BARNES, A.B., M.S.
Instructor in Mathematics and Astronomy

EDGAR BENNETT BLOOM, A.B., M.S., PH.D.
Instructor in Chemistry

HALLETT BARKER HAMMATT, B.A., M.A.
Instructor in Mathematics

CARL ARTHUR KEELER, A.B., M.A.
Instructor in Mathematics

JEROME MARTIN MILLER, B.S., M.S.
Instructor in Chemistry

RUSSELL BENJAMIN PARKS, A.B., A.M.
Instructor in English

HENRY SCHENCK, A.B., M.A.
Instructor in English

EUGENE HULSE SLOANE, B.A., M.A.
Instructor in English

WILLIAM LEVI KICHLINE, B.A., M.S.
Instructor in Mathematics

FREDERIC ALLEN SCOTT, B.S., M.S.
Instructor in Physics

HENRY HARE CARTER, B.S.
Instructor in Romance Languages

WILBER EDWARD HARVEY, Met.E.
Instructor in Metallurgy

DANIEL BAILEY, B.S., M.S.
Instructor in Physics

CALDWELL BUCK, A.B., M.A.
Instructor in Economics

JOHN ROBERT CONNELLY, B.S. in M.E., M.S.
Instructor in Mechanical Engineering

RICHARD HENRY CRUM, A.B., A.M.
Instructor in Latin

DALE HARTZLER GRAMLEY, A.B., M.S.
Instructor in Journalism

CLEMENT LONG HENSHAW, B.S. in Phys., M.A.
Instructor in Physics

FREDERICK TAYLOR HOLMES, B.A.
Instructor in Physics

DANIEL CLARK LEWIS, jr., A.B., A.M.
Instructor in Mathematics

STUART BARTLETT MEAD, B.S. in Bus. Ad., A.M.
Instructor in Accountancy

HILL REID NETTLES, C.E.
Instructor in Civil Engineering

JOHN ALLEN OSTEEN, B.S.
Instructor in Physics

JAMES KENNETH ROGERS, A.B., A.M.
Instructor in Geology

ARTHUR ROSE, B.A., M.A., Ph.D.
Instructor in Chemistry

ROBERT STONE, B.P.E., M.A.
Instructor in Psychology

GEORGE BOYD THOM, M.E.
Instructor in Mechanical Engineering

ASSISTANTS

THOMAS JOSEPH LAVIN, Staff Sergt., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

FRED JOHN MOHRING, Tech. Sergt., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

JAMES MAHONEY
Assistant in Swimming

HAROLD PHILIP WHITENIGHT, B.S.
Assistant in Chemistry

RICHARD JOHN DeGRAY, Ch.E., M.S.
Assistant in Chemistry

MICHAEL ANTHONY FARRELL, B.S.
Assistant in Bacteriology

HUGH SMILEY STANLEY, A.B., A.M.
Graduate Assistant in Mathematics

FRANCIS JOHN TREMBLEY, B.S.
Assistant in Biology

RALPH NEWCOMB VanARNAM, E.E., M.S.
Assistant in Mathematics and Astronomy

GEORGE FRANCIS GASDA, Sergt., D.E.M.L., U. S. A.
Assistant in Military Science and Tactics

ELMER RAYMOND BINKLEY, B.S.
Graduate Assistant in Physics

JACOB LEE CLEMMER, B.S.
Graduate Assistant in Physics

GEORGE WELLINGTON HARTZELL, B.A.
Graduate Assistant in German

JOSEPH EDWARD ILLICK, C.E.
Graduate Assistant in Mathematics

CARES CREIGHTON KEYSER, C.E.
Laboratory Assistant in Civil Engineering

EDWIN ENOS LEIDICH, B.S.
Graduate Assistant in Physics

ROBERT KREADY MOWRER, B.S.
Graduate Assistant in Physics

LEHMAN CHARLES SHUGART, A.B.
Graduate Assistant in Physics

FELLOWS AND RESEARCH ASSISTANTS

EARK SHIRK GREINER, B.S. in Met.E.
H. M. Byllesby Research Fellow

THEODORE HENRY MARSHALL, B.S.
R. K. Laros Silk Company Research Fellow

EDGAR BENNETT BLOOM, A.B., M.S., Ph.D.
Columbian Carbon Research Fellow

HELEN DRINKWATER CHATAWAY, B.A., B.Sc., M.S., Ph.D.
Archer-Daniels-Midland Company and William O. Goodrich Company Special Research Assistant

JOHN DeHAVEN LONG, B.S.
H. M. Byllesby Research Fellow

GEORGE FRANCIS BEAL, B.S. in Ch.E.
New Jersey Zinc Company Research Fellow

FOREST THEODORE BENTON, jr., Ch.E.
Barrett and Company Leather Research Fellow

WALLER HOWARD HOBACK, A.B.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

PHILIP KRATZ, Ch.E.
Hunt-Rankin Leather Company Research Assistant

WILLIAM S. WRIGHT McCARTER, B.S. in Ch.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

EDWARD WEST MIDLAM, JR., CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

JOHN ZOLLINGER MILLER, CH.E.
Student Chemistry Foundation Research Fellow

CHARLES TILGHMAN OSWALD, CH.E.
Student Chemistry Foundation Research Fellow

GEORGE WESLEY PARKINSON, B.S.C.
Lehigh Institute of Research Fellow

ALFRED EDWARD RHEINECK, B.S. IN CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

OSCAR BERNHARDT SCHIER, M.E.
James Ward Packard Research Fellow

COMMITTEES OF THE FACULTY

(The term of each member expires in June of the year given in parenthesis after his name. The President is ex officio a member of all committees)

ADMISSIONS: Dean McConn (*ex officio*), Registrar Curtis (*ex officio*), Professors Reynolds (1930), Anderson (1931), S. M. Brown* (1932), S. A. Becker (1933), Fox (1934), More (1935), Drown (1936).

ADVANCED STANDING: Registrar Curtis (*ex officio*), Professors Turner (1930), Bidwell (1931), Fort (1932), Bradford (1933).

ATHLETICS (FACULTY MEMBERS OF THE BOARD OF CONTROL OF ATHLETICS): Professors Reiter (*ex officio*), Ogburn (1930), Beaver (1931), Weida (1932).

CHAPEL: Professors Ogburn (1930), Babasinian (1931), Butts (1932), Klein (1933), Reynolds (1934).

DISCIPLINE: Dean McConn (*ex officio*), Professors Cowin (1930), Petersen (1931), Thomas (1932).

* Absent on leave, Professor Schulz serving.

Educational Policy: Professors Hall (1930), F. V. Larkin (1931), Vice-President Emery (1932), Professors Eckfeldt (1933), Carothers (1934).

Faculty Educational Club: Vice-President Emery, Professors Reynolds, B. L. Miller, Kegel, Anderson, Petersen.

Honorary Degrees: Professors Goodwin (1930), Ogburn (1931), Librarian Leach (1932), Professors Gipson (1933), B. L. Miller (1934), Slater (1935).

House Committee, Drown Hall: Professor Toohy (1930), and two student members: Messrs G. L. DeHuff and H. J. Muendel.

Inspection Trips: Professors Seyfert (1930), Payrow (1931), Wilson (1932), Stuart (1933), Anderson (1934).

Library: Librarian Leach (*ex officio*), Professors Ullmann (1930), Hall (1931), Gipson (1932), Diamond (1933).

Petitions: Dean McConn (*ex officio*), Registrar Curtis (*ex officio*), Professors Harmon (1930), Hibshman (1931), Jensen (1932).

Publications, Board of: Dean McConn (*ex officio*), Professors Chamberlin* (1930), Luch (1931), and three student members: Messrs. L. R. Hewitt, J. H. Girdler, and J. K. Deichler.

Roster: Registrar Curtis (*ex officio*), Professors Diefenderfer (1930), Beaver (1931), Uhler (1932), Neville (1933).

Standing of Students: Dean McConn, Registrar Curtis, Professors Palmer, Carothers, Fogg, F. V. Larkin, Stoughton, Eckfeldt, Barker, Ullmann, Bidwell (all members *ex officiis*).

Student Activities: Dean McConn (*ex officio*), Professors Toohy (1930), Beck (1931), and three student members: Messrs. D. B. Atkins, W. G. Figoni, and W. E. Blackmar.

Student Clubs: Dean McConn (*ex officio*), Professor Bradford (1930), Dr. Bull (1931), and three student members: Messrs. R. J. Lincoln, F. W. Emhardt, and W. D. Kelly, II.

Summer Session: Vice-President Emery (*ex officio*), Professors Cowin (1930), Drown (1931), Hughes (1932), Weida (1933), Smith (1934).

* Absent on leave, Professor Fretz serving.

OFFICERS OF ADMINISTRATION

Office of the President

Charles Russ Richards, M.M.E., Eng.D., LL.D., *President*

Office of the Vice-President and Comptroller

Natt Morrill Emery, A.B., M.A., Litt.D., *Vice-President and Comptroller*

Frederick Ralph Ashbaugh, *Bursar and Purchasing Agent*

Melvin Schissler, C.P.A., *Bookkeeper*

Englebert Henry Baderschneider, M.E., *Manager of Supply Bureau*

Office of the Dean

Charles Maxwell McConn, B.A., M.A., *Dean*

George Bartlett Curtis, B.A., A.M., *Associate Dean*

Office of the Registrar

George Bartlett Curtis, B.A., A.M., *Registrar*

Paul Englebert Schwartz, B.S., *Assistant Registrar*

Jeannette Cleveland, *Recorder*

Mrs. Eunice Strauss Kichline, *Assistant Recorder*

Directors of Curricula

Philip Mason Palmer, A.B., *Director of the College of Arts and Science*

Neil Carothers, B.A., Ph.D., *Director of the College of Business Administration*

Harry M. Ullmann, A.B., Ph.D., *Director of the Curricula in Chemistry and Chemical Engineering*

Ralph Justin Fogg, B.S., *Director of the Curriculum in Civil Engineering*

Joseph Warren Barker, S.B., S.M., *Director of the Curriculum in Electrical Engineering*

Charles Clarence Bidwell, A.B., Ph.D., *Director of the Curriculum in Engineering Physics*

Fred Viall Larkin, B.S., M.E., *Director of the Curricula in Mechanical Engineering and Industrial Engineering*

Bradley Stoughton, Ph.B., B.S., *Director of the Curriculum in Metallurgical Engineering*

Howard Eckfeldt, B.S., E.M., *Director of the Curriculum in Mining Engineering*

Summer Session

Natt Morrill Emery, A.B., M.A., Litt.D., *Director*

Faculty

George Bartlett Curtis, B.A., A.M., *Secretary*

Legal Counsel

Robert Sayre Taylor, B.S., *Legal Counsel*

Linderman Memorial Library

Howard Seavoy Leach, A.B., M.A., *Librarian*

Cora Knutsford Dunnells, *Cataloguer*

Elizabeth Baer Hay, A.B., B.S. in L.S., *Circulation Desk Attendant*

Isabel Ardery Boone, A.B., B.S. in L.S., *Junior Assistant Cataloguer*

Gertrude A. Hough, *Assistant Desk Attendant*

Robert F. Riley, *Clerk*

Packer Memorial Church

The Very Rev. Daniel Wilmot Gateson, B.A., *Chaplain*

Thomas Edgar Shields, A.A.G.O., *Organist*

Bureau of Student Employment and Housing

Frederick Thomas Trafford, *Secretary*

Students' Health Service

Raymond Cooley Bull, B.S., A.B., M.D., *Director*

Waldemar Theodore Fedko, B.S., M.D., *Assistant Director*

Mrs. Jennie Vye Dacey, R.N., *Nurse in charge of Dispensary*

Harry Frederick Hoffman, M.D., *Psychiatrist*

William Michael Burkhardt, *Masseur*

Athletics

John Grafius Petrikin, B.S., *Graduate Manager of Athletics*

University Band

Thomas Edgar Shields, A.A.G.O., *Director*

Lehigh Union

FREDERICK THOMAS TRAFFORD, *Secretary*

Promotion and Publicity

ANDREW EDWARD BUCHANAN, JR., CH.E., *Director*

Office of Supervising Architect

ANDREW WILLARD LITZENBERGER, *Supervising Architect*

JOHN DAVID HARTIGAN, *Superintendent of the Power Plant*

Standing Committees

ART EXHIBITIONS: Professors Palmer, Howland, Librarian Leach, Vice-President Emery.

GRADUATE BOARD: President Richards (*ex officio*), Dean McConn (*ex officio*), Professors Thomas, Chamberlin, Carothers, Smith, Larkin, Miller, More (*Secretary*), Gipson, Hughes, Seyfert, Fort, Bidwell.

INSTITUTE OF RESEARCH: President Richards (*ex officio*), Professors Ullmann, Fogg, Barker, Larkin, Stoughton, Eckfeldt, Bidwell, Miller, Hall, Carothers, Gipson.

LECTURES: Professors Seyfert (1930), Sinkinson (1930), Dean McConn (1931), Professors Howland (1931), Diamond (1932), Schulz (1932).

MENTAL HYGIENE: Professor Hughes, Dean McConn, Dr. Bull, Dr. Hoffman.

REGISTER: Vice-President Emery, Registrar Curtis, Professors Smith, Cowin, Wilson.

SCHOLARSHIPS AND LOANS: Vice-President Emery, Dean McConn, Treasurer Okeson.

TEACHER PLACEMENT: Professor Hughes, Dean McConn, Professors Drown, Palmer, Carothers, Ullmann.

WILLIAMS SENIOR PRIZE: Professors Smith, Palmer, Hughes, Carothers.

REQUIREMENTS FOR ADMISSION

Candidates for admission to Lehigh University must be at least sixteen years of age, must present testimonials of good moral character, and must be qualified in fifteen entrance units as enumerated below. The University reserves the right to re-

quire any candidate for admission to present himself for a personal interview and to select candidates otherwise qualified on the basis of such an interview. Women are not admitted to the work of the first semester or of the second semester either as undergraduate students or as special students.

All students entering the University are required to present a certificate of vaccination against small-pox within three years of the time of entering the University. They must also have a scar as evidence of previous successful vaccination. Students who cannot comply with this regulation will be vaccinated by the Director of the Health Service, and in case the vaccination is unsuccessful will be re-vaccinated.

THE COLLEGE OF ARTS AND SCIENCE

Candidates for admission to the College of Arts and Science must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Elective subjects,	6½
	15

THE COLLEGE OF BUSINESS ADMINISTRATION

Candidates for admission to the College of Business Administration must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Elective subjects,	6½
	15

* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

THE COLLEGE OF ENGINEERING

Candidates for admission to the College of Engineering must present credit in the following units:

	Units*
English,	3
Latin or German or French or Spanish,	2
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
Elective subjects,	5½
	15

ELECTIVE SUBJECTS

	Units
English, fourth year,	1
Intermediate Algebra, second term,	½
Advanced Algebra,	½
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
Greek,	1, 2, or 3
Latin,	1, 2, 3, or 4
French,	1, 2, 3, or 4
German,	1, 2, 3, or 4
Spanish,	1, 2, 3, or 4
American History,	1
Ancient History,	½ or 1
Modern History,	1
English History,	½ or 1
Civics,	½, 1, or 1½
Economics,	½ or 1
General Science,	1
Physics,	1 or 2
Chemistry,	1 or 2
Biology,	½, 1 or 2
Botany,	½ or 1
Zoology,	½ or 1
Physiography,	½ or 1
Industrial History,	½ or 1
Business Law,	½ or 1
Commercial Geography,	½ or 1

* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

Applicants may also elect not more than two units from the following supplementary list:

Physiology and Hygiene,	½ or 1
Manual Training,	½ or 1
Freehand Drawing,	½
Mechanical Drawing,	½
Bookkeeping, Stenography and Typewriting,	1 or 2

Other subjects from the curriculum of a high school of the first class may be credited up to a total of one unit.

ADMISSION BY CERTIFICATE

Lehigh University has no permanent arrangement with any school whereby certificates are accepted in lieu of entrance examinations; but certificates are ordinarily accepted from first-class high schools in Pennsylvania, and from schools accredited by the Association of Colleges and Secondary Schools of the Middle States and Maryland, the New England College Entrance Certificate Board, the Regents of the University of the State of New York, the North Central Association of Colleges and Secondary Schools, the Association of Colleges and Secondary Schools of the Southern States, and the state universities of those states having such institutions.

An applicant for admission by certificate should request his school principal to send to the Registrar upon completion of his course a complete record of his work. Blanks for this purpose will be supplied by the University.

Each candidate for admission must present full school and college records from each institution previously attended. Failure to present such records will result in cancellation of registration.

ADMISSION BY EXAMINATION

Examinations at the University

Examinations for admission to the University will be held in 1930 as follows:

Algebra, Elementary	June 12,	Sept. 5,	8:30 a.m.
Algebra, Intermediate	June 12,	Sept. 5,	10:30 a.m.
Algebra, Advanced	June 12,	Sept. 5,	2:00 p.m.
Biology	June 14,	Sept. 8,	2:00 p.m.
Botany	June 14,	Sept. 8,	2:00 p.m.
Chemistry	June 13,	Sept. 6,	8:30 a.m.
Civics	June 14,	Sept. 8,	2:00 p.m.

Commercial Geography	June 11,	Sept. 4,	2:00 p.m.
Economics	June 12,	Sept. 5,	2:00 p.m.
English	June 14,	Sept. 8,	8:30 a.m.
Freehand Drawing	June 14,	Sept. 8,	2:00 p.m.
French	June 13,	Sept. 6,	2:00 p.m.
General Science	June 14,	Sept. 8,	2:00 p.m.
Geometry, Plane	June 11,	Sept. 4,	8:30 a.m.
Geometry, Solid	June 11,	Sept. 4,	10:30 a.m.
German	June 13,	Sept. 6,	2:00 p.m.
Greek	June 13,	Sept. 6,	2:00 p.m.
History			
American	June 12,	Sept. 5,	2:00 p.m.
Ancient	June 11,	Sept. 4,	8:30 a.m.
English	June 12,	Sept. 5,	8:30 a.m.
Mediaeval and Modern	June 11,	Sept. 4,	2:00 p.m.
Industrial History	June 11,	Sept. 4,	2:00 p.m.
Latin	June 13,	Sept. 6,	8:30 a.m.
Mechanical Drawing	June 14,	Sept. 8,	2:00 p.m.
Physics	June 13,	Sept. 6,	8:30 a.m.
Physiography	June 14,	Sept. 8,	2:00 p.m.
Physiology	June 14,	Sept. 8,	2:00 p.m.
Problems of Democracy	June 11,	Sept. 4,	2:00 p.m.
Spanish	June 13,	Sept. 6,	8:30 a.m.
Trigonometry	June 12,	Sept. 5,	2:00 p.m.

Examinations in other subjects presented for elective units may be arranged by correspondence with the Registrar.

Candidates for admission wishing to take examinations for advanced credit in any subjects should notify the Registrar before September 1.

Examinations at Schools

Upon the request of school principals the June entrance examinations may be held at schools on the regularly scheduled dates. Requests for examination papers should be sent to the Registrar before June 1.

College Board Examinations

Certificates of the College Entrance Examination Board are accepted in subjects in which the recorded grade is 60 per cent or higher.

The examinations of the College Entrance Examination Board are held in June of each year. Information in regard to these examinations, application blanks, and a circular giving detailed definitions of requirements in all examinations may be obtained by addressing the Secretary of the College Entrance Examination Board, 431 West 117th Street, New York, N.Y.

ADMISSION TO ADVANCED STANDING

A student desiring to transfer to Lehigh University from another college or university must submit an official transcript of his record in the other institution, which should include his college credits and a list of the entrance credits accepted for admission to that other institution, and a statement of honorable dismissal.

A candidate for admission to Lehigh University with advanced standing must be able to meet the entrance requirements prescribed for undergraduates. In the event that the entrance credits presented for admission to the former institution do not meet the entrance requirements of Lehigh University in full, subjects which have been taken in college may be presented to make up the deficiencies. No student is admitted to Lehigh University who is not eligible to continue in good scholastic standing at the institution from which he is transferring.

A candidate who has attended one or more colleges or universities must present a record from each of these institutions; failure to submit a complete record of former academic experience will result in cancellation of registration.

Graduates of other colleges are admitted to Lehigh University without examinations. The length of time for the completion of a curriculum will depend upon the student's attainments at entrance and upon his ability.

A student who intends to take an engineering curriculum at Lehigh University after graduation from college should so arrange his work in college as to cover as many as possible of the subjects of the freshman and sophomore years of the engineering curriculum he selects.

ADMISSION OF SPECIAL STUDENTS

Applicants for special schedules may be accepted as special students on recommendation of the head of the curriculum in which the student proposes to do his special work, and upon approval of the Dean. Candidates must be at least twenty-one years of age and must present evidence of ability to pursue with profit the subjects that they wish to study at the University. No special student is permitted to take any subject unless in the opinion of the professor in charge he is thoroughly prepared in all the necessary preceding branches.

ADMISSION TO GRADUATE COURSES

A student who has taken the bachelor's degree or a degree in technology at any recognized college, university, or technical institution may be admitted as a graduate student and by permission of the Graduate Board may pursue studies leading to the degree of Master of Arts or Master of Science under the following regulations:

1. All work which is to be credited toward a master's degree shall be done in actual and regular attendance at the University.

2. A minimum of thirty semester hours is required for the master's degree.

3. Each graduate student must submit for approval of the Graduate Board the program of courses he proposes to take to satisfy the requirements for the Master's degree.

4. At least eighteen of the required thirty semester hours must be taken in one department. The remaining twelve hours will ordinarily be taken in one or two other departments; but the entire thirty hours may, with the approval of the Graduate Board, be taken in a single department. In all cases, however, the work must be taken under at least two instructors, and the distribution of the work shall be made upon the advice and with the approval of the head of the major department.

5. At least twelve of the eighteen semester hours required in the major department and at least fifteen of the thirty semester hours required for the degree must be taken in courses open primarily to graduates.

6. A thesis may be required by the major department. If required, the thesis shall not count for more than six credit hours. Two bound typewritten copies of the thesis (one of which shall be an original copy), approved by the head of the major department, shall be placed in the hands of the Secretary of the Graduate Board at least two weeks before the day on which the degree is to be conferred.

The form of the thesis must conform to the specifications that have been established by the Graduate Board. Full information concerning these specifications may be obtained from the Librarian of the University or from the Secretary of the Graduate Board.

7. The Master's degree will not be granted unless the candidate has earned the grade A or B in at least three-fifths of his work. No course in which the grade earned is less than C will count towards the degree.

8. Candidates employed as full-time teachers in the University or elsewhere may not take more than six hours of graduate work in any one semester.

9. Tuition for graduate work is at the rate of $10.00 per semester hour.

10. The registration day for graduate students each semester is the Saturday following the registration days for undergraduates. All graduate registration must be completed within three weeks of that date.

11. Women are admitted as graduate students on the same terms as men except that registration in courses open to undergraduates is subject to the special approval of the head of the department concerned.

When all requirements have been met, the candidate will be recommended by the Faculty to the Trustees for the Master's degree appropriate to the work pursued.

ENTRANCE REQUIREMENTS IN DETAIL

ENGLISH

Preparation in English has three main objects: (a) command of correct and clear English, spoken and written; (b) ability to use the vernacular with accuracy and appreciation; and (c) some acquaintance with the simpler English classics.

English Grammar and Composition. The first two objects require instruction in grammar and composition. English grammar should be reviewed in the secondary school, and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of English composition governing punctuation, the use of words, paragraphs, and the different kinds of composition, including letter-writing, should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary school period. Written exercises may well comprise narration, description, and easy exposition based upon the principles of elementary rhetoric, as given in any approved high school rhetoric. It is advisable that subjects for this work be taken from the students' personal experience, general knowledge, and studies other than English, as well as from his reading in literature.

LITERATURE. The third object is sought by means of two lists of books, headed respectively reading and study, from which may be framed a progressive course in literature covering four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and in prose. The books for reading and study are to be selected from the group suggested by the Conference on Uniform Entrance Requirements in English. 3 or 4 units

HISTORY

The requirement in history is based on the recommendation of the Committee of Seven of the American Historical Association.

ANCIENT HISTORY, with special reference to Greek and Roman History, including also a short introductory study of the more ancient nations, and the chief events of the early Middle Ages down to the death of Charlemagne (814). 1 unit

MEDIAEVAL AND MODERN EUROPEAN HISTORY, from the death of Charlemagne to the present time. 1 unit

ENGLISH HISTORY, with due reference to social and political development. 1 unit

AMERICAN HISTORY AND CIVIL GOVERNMENT, with due reference to social and political development. 1 unit

The examinations in history will be so framed as to require comparison and the use of judgment on the pupil's part rather than the mere use of memory. The examinations will presuppose the use of good text-books, collateral reading, and practice in written work. Geographical knowledge will be tested by requiring the location of places and movements on an outline map.

MATHEMATICS

ELEMENTARY ALGEBRA (ALGEBRA TO QUADRATIC EQUATIONS). The four fundamental operations for rational algebraic expressions. Factoring, determination of highest common factor and lowest common multiple by factoring. Fractions, including complex fractions, and ratio and proportion. Linear equations, both numerical and literal, containing one or more unknown numbers. Problems depending on linear equations. Radicals, including the extraction of the square root of polynomials and of numbers. Exponents, including the fractional and negative. 1 unit

INTERMEDIATE ALGEBRA (QUADRATIC EQUATIONS AND BEYOND). Quadratic equations, both numerical and literal. Simple cases of equations with one or more unknown numbers that can be solved by the methods of linear or quadratic equations. Problems depending on quadratic equations. The binomial theorem for positive integral exponents. The formulas for the nth term

and the sum of the terms of arithmetic and geometric progressions with applications. ½ unit

Advanced Algebra. Permutations and combinations, limited to simple cases. Complex numbers, with graphical representation of sums and differences. Determinants, chiefly of the second, third, and fourth orders, including the use of minors and the solution of linear equations. Numerical equations of higher degree, and as much of the theory of equations, with graphical methods, as is necessary for their treatment, including Descartes' rule of sign and Horner's method, but not Sturm's functions or multiple roots. ½ unit

Plane Geometry. The usual theorems and constructions of good text-books, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons; and the measurement of the circle. The solution of numerous original exercises, including locus problems. Applications to the mensuration of lines and of plane surfaces. 1 unit

Solid Geometry. The usual theorems and constructions of good text-books, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders, and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including locus problems. Applications to the mensuration of surfaces and solids. ½ unit.

Plane Trigonometry. Definitions and relations of the six trigonometric functions as ratios. Circular measurements of angles. Proofs of principal formulas, in particular for the sine, cosine, and tangent of the sum and the difference of two angles, of the double angle, and the half angle, the product expressions for the sum or the difference of two sines or of two cosines, etc.; the transformation of trigonometric expressions by means of these formulas. Solution of trigonometric equations of a simple character. Theory and use of logarithms (without the introduction of work involving infinite series). The solution of right and oblique triangles and practical applications. Candidates must bring their logarithmic tables to the examination. ½ unit

Candidates must have a knowledge of the metric system and be prepared to solve problems in either algebra or geometry involving the use of the metric system.

The entrance requirements in Solid Geometry and Plane Trigonometry are included in Math. 1 and Math. 16 offered during the Summer Session.

GREEK

Greek. Grammar; elementary prose composition, consisting principally of detached sentences to test the candidate's knowledge of grammatical construction; Xenophon: the first

four books of the *Anabasis;* the translation, at sight, of a passage from some work of Xenophon. 2 units

Greek. Homer's *Iliad,* I-III: The first three books of the *Iliad* (omitting II, 494-end), and the Homeric forms, constructions, and prosody. 1 unit

LATIN

The requirements in Latin are in accord with those of the College Entrance Examination Board.

The Latin reading shall not be less in amount than four books of Cæsar, six orations of Cicero, and six books of Virgil's Aeneid for the second, third, and fourth years respectively. There are no prescribed readings, but the following recommendations are made:

(1) In the second year the early reading should be easy Latin which may be "made" or adapted Latin; not less than one semester of this year should be devoted to the reading of selections from Cæsar. The reading for the year may also include easy selections from such authors as Aulus Gellius, Eutropius, Nepos, Phaedrus, Quintus Curtius Rufus, and Valerius Maximus, or books of selections containing some of these together with other authors of prose works.

(2) In the third year, if the reading be in prose, not less than one semester should be devoted to the reading of selections from Cicero; the reading for the year may also include selections from such authors as Pliny, Sallust, and Livy, or books of selections containing these and other authors of prose works.

(3) In the fourth year, if the reading be in poetry, not less than one semester should be devoted to the reading of selections from Virgil; and the reading for the year may also include selections from such works as the Metamorphoses, Tristia, Heroides, and Fasti of Ovid, or books of selections containing poems or extracts from Ovid or from other poets.

The College Entrance Examination Board has prepared a word list which indicates a vocabulary that students are expected to have at the end of two years, three years, and four years of Latin study. The list will serve to reassure teachers that deviation from the beaten path is safe provided they take the required vocabulary as one of their guides in making their choice of selections from the works recommended above. This word list may be obtained from the College Entrance Examination Board, 431 West 117th Street, New York, N. Y.

GERMAN

Elementary German, A. This requirement follows, in the main, the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) Careful drill in pronunciation. (2) The memorizing and frequent repetition of easy colloquial sentences. (3) Drill upon the rudiments of grammar, that is, upon the inflection of the articles, of such nouns as belong to the language of everyday life, of adjectives, pronouns, weak verbs, and the more usual strong verbs; also upon the use of the more common prepositions, the simpler use of the modal auxiliaries, and the elementary rules of syntax and word-order. (4) Abundant easy exercises, designed not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression. (5) Reading of from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lesson (the teacher giving the English), and in the reproduction from memory of sentences previously read.

During the second year the work should comprise: (1) The reading of from 150 to 200 pages of literature in the form of easy stories and plays. (2) Accompanying practice, as before, in the translation into German of easy variations upon the matter read and in the off-hand reproduction, sometimes orally and sometimes in writing, of the substance of short and easy selected passages. (3) Continued drill in the rudiments of the grammar, directed to the ends of enabling the pupil, first, to use his knowledge with facility in the formation of sentences, and, secondly, to state his knowledge correctly in the technical language of grammar. 2 units

Intermediate German, B. This work should comprise, in addition to the elementary course, the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tenses and modes (with special reference to the infinitive and subjunctive), and likewise upon word order and word formation. 1 unit

FRENCH

Elementary French, A. This requirement follows in the main the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) Careful drill in pronunciation. (2) The rudiments of grammar, including the inflection of the regular and the more common irregular verbs, the plural of nouns, the inflections of adjectives,

participles, and pronouns; the use of personal pronouns, common adverbs, prepositions, and conjunctions; the order of words in the sentence and the elementary rules of syntax. (3) Abundant easy exercises, designed not only to fix in the memory the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression. (4) The reading of from 100 to 175 pages of standard texts, with constant practice in translating into French easy variations upon the sentences read (the teacher giving the English), and in reproducing from memory sentences previously read. (5) Writing French from dictation.

During the second year the work should comprise: (1) The reading of from 250 to 400 pages of easy modern prose in the form of stories, plays, or historical or biographical sketches. (2) Constant practice, as in the previous year, in translating into French easy variations upon the texts read. (3) Frequent abstracts, sometimes oral and sometimes written, of portions of the text already read. (4) Writing French from dictation. (5) Continued drill upon the rudiments of grammar, with constant application in the construction of sentences. (6) Mastery of the forms and uses of pronouns and pronominal adjectives, of all but the rare irregular verb forms, and of the simpler uses of the conditional and subjunctive. 2 units

Intermediate French, B. This should comprise the reading of from 400 to 600 pages of French of ordinary difficulty, a portion to be in the dramatic form; constant practice in giving French paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; the study of a grammar of moderate completeness; writing from dictation. 1 unit

SPANISH

Elementary Spanish, A. Two years' preparation, covering the following ground:

During the first year: (1) Drill in the correct production of Spanish sounds. (2) The rudiments of grammar, illustrated by abundant easy exercises. (3) The reading of about 150 pages of graduated text with constant translating into Spanish of easy variations of sentences read, the teacher giving the English. (4) Aural drill: practice in translating into English Spanish words, clauses, and sentences heard but not seen, the teacher giving the Spanish.

During the second year: (1) Reading of 250 to 400 pages of easy modern prose. (2) Constant practice in translating into Spanish easy variations upon the text read. (3) Aural practice and drill in pronunciation. (4) Mastery of the forms and uses of pronouns, of the subjunctive mode, and of the forms of the radical changing verbs. 2 units

Intermediate Spanish, B. The reading of not less than 500 additional pages of Spanish prose together with the translation of at least 40 pages of simple connected English prose into Spanish. 1 unit

PHYSICS

The course of instruction in physics should include:

(a) The study of some standard text-book, for the purpose of obtaining a connected view of the subject; (b) instruction by lecture table demonstrations, to be used mainly for illustration of the facts and phenomena of physics; (c) individual laboratory work consisting of at least thirty experiments.

The aim of laboratory work should be to supplement the pupil's fund of concrete knowledge and to cultivate his power of accurate observation and clearness of thought and expression. The exercises should be chosen with a view to furnishing forceful illustration of fundamental principles and their practical application. They should be such as to yield results capable of ready interpretation, obviously in conformity with theory, and free from the disguise of unintelligible units. 1 unit

CHEMISTRY

The requirement in chemistry is based on the report of the Committee on Chemistry of the Science Department of the National Education Association.

Elementary Chemistry. It is recommended that the candidate's preparation in chemistry include: (a) individual laboratory work, comprising at least forty exercises; (b) instruction by lecture table demonstrations, to be used mainly as a basis for questioning upon the general principles involved in the pupil's laboratory investigations; (c) the study of at least one standard text-book, to the end that the pupil may gain a comprehensive and connected view of the most important facts and laws of elementary chemistry. 1 unit

Students properly qualified will be examined in Elementary Chemistry during Freshman Week; those passing the examination will be privileged to omit Elementary Chemistry, Chem. 1 and 11, and will take instead Chem. 3 and 13 during the first semester.

BIOLOGY

Biology. A year's work in general biology. 1 unit

In order to be acceptable as a substitute for college biology, the course offered may not be botany, zoology, or physiology but must be a general course covering such topics as are enumerated in the description of Biology 1 in this Register. Whether the course offered is acceptable will be determined at the University.

ZOOLOGY

Zoology. The equivalent of Jordan, Kellogg, and Heath's *Animal Studies*, with laboratory work. ½ or 1 unit

BOTANY

Botany. An amount equal to that contained in Bergen's *Foundations of Botany*, with laboratory work. ½ or 1 unit

PHYSIOLOGY AND HYGIENE

Physiology and Hygiene. A course covering approximately what is given in such a text-book as Huxley and Youman's *Physiology and Hygiene*. ½ or 1 unit

PHYSIOGRAPHY

Physiography. The study of a standard text-book in physical geography, that a knowledge may be gained of the essential principles and of well-selected facts illustrating those principles. Individual laboratory work, comprising at least forty exercises, with notebook, is recommended. ½ or 1 unit

In Zoology, Botany, Physiology and Hygiene, and Physiography the credit given depends on the extent of the course pursued in the preparatory school.

DRAWING

Freehand Drawing. Sketching of simple geometrical figures, of objects, and from copy. At least twenty plates must be submitted. ½ unit

Mechanical Drawing. The use of instruments and the preparation of at least twenty plates, illustrating the elements of descriptive geometry or simple machine parts. ½ unit

MANUAL TRAINING

Manual Training. Shop work in wood or metal in schools giving courses in manual training. ½ or 1 unit

BOOKKEEPING, TYPEWRITING, AND STENOGRAPHY

Bookkeeping, Typewriting, and Stenography, covering a formal course of study in school. 1 or 2 units

TUITION AND OTHER FEES

Tuition, in all colleges of the University, per annum....	$400.00
Health Service Fee, per annum	12.00
Athletic Fee, per annum	15.00
Library Fee†	5.00
Student Activities Fee	4.00
Total Annual Fees	$436.00

These fees are payable as follows:

FIRST SEMESTER

(Payable on the Registration Days in September)

Tuition Fee	$225.00
One-half of the Annual Health Service Fee	6.00
One-half Student Activities Fee	2.00
Athletic Fee, in full	15.00
Three-fifths of the Annual Library Fee	3.00
Total Fees, First Semester	$251.00

SECOND SEMESTER*

(Payable on the Registration Days in February)

Tuition Fee	$175.00
One-half of the Annual Health Service Fee	6.00
One-half Student Activities Fee	2.00
Two-fifths of the Annual Library Fee	2.00
Total Fees, Second Semester	$185.00

MATRICULATION AND GRADUATION FEES. New students pay, once only, on admission, a Matriculation Fee of $5.00; students at graduation pay a Graduation Fee of $10.00.

LABORATORY FEES. There are also laboratory fees or deposits in laboratory courses to cover the actual cost of laboratory supplies used by the individual students and to provide for

* Students entering or re-entering in the second semester pay first semester fees, except that they pay only one-half the Athletic Fee, $7.50.

† Not charged in the cases of students in the Summer Session, special students, or students registered for six semester hours or less.

breakage of glassware and instruments. The amounts of these fees and deposits are given in the Description of Courses in connection with each laboratory course. A deposit of $25.00 is made by each student taking courses in Military Science and Tactics. This deposit is refunded when the government property issued to the student is returned.

Late Registration Fees. The penalty for late registration is $1.00 a day, up to a maximum of $5.00, for each day of delay beyond the registration days in taking out the registration ticket; and a registration not completed within five days after the date on the registration ticket is subject to a late registration fee of $5.00 a day. No registration will be accepted later than the tenth day of instruction.

Summer Session Tuition. The tuition for courses taken in the Summer Session is at the rate of $10.00 per credit hour.

Special Examination Fees. Special examinations, authorized by the Committee on Standing of Students, are subject to a fee of $5.00 each. This regulation applies to the psychological examination required of new students, if taken at other than the scheduled date. Any student who fails to keep his appointment for his physical examination is charged a late examination fee at the rate of $1.00 a day until he applies for and receives another appointment; if he fails to meet his second appointment or any succeeding appointments, he will become subject again to the same fee at the same rate.

Refunds. A refund of one-half of the tuition and laboratory fees of the current semester, one-half of the athletic fee and of the student activities fee, and the unused balance of chemistry deposits, will be made to students who formally withdraw from the University within four weeks after the beginning of the semester; a refund of three-fourths of the tuition and laboratory fees, one-half of the athletic fee and of the student activities fee, and the unused balance of chemistry deposits will be made to students who formally withdraw within two weeks; a refund of the entire tuition and laboratory fees, the entire athletic fee and the student activities fee, and the unused balance of chemistry deposits will be made to students who formally withdraw within one week. The

matriculation fee, the health service fee, and the library fee will in no case be refunded. If a student is obliged to withdraw through injury or other physical disability and is unable to return later in that semester, a pro-rata credit will be allowed toward the tuition of the corresponding semester a year later.

Special Schedules. Tuition for special schedules of less than twelve hours in any semester is at the rate of $12.50 per semester hour.

Student Activities Fee. The Student Activities fee is appropriated as follows: Lehigh *Brown and White*, $1.75; Lehigh Union, $.75; Arcadia, $.50; Class dues, $1.00.

Graduate Students Fees. The tuition for graduate courses is at the rate of $10.00 per credit hour. Graduate students pay the matriculation and library fees; they are given the option of paying or not paying the athletic and health service fees; if they pay these fees they obtain the corresponding benefits.

To be eligible for a degree from Lehigh University, a student not only must have completed all of the scholastic requirements for the degree, but must have paid all University fees and all bills for the rental of rooms in the dormitories, or for damage to University property or equipment, or for any other indebtedness to the University; this regulation, however, does not apply to any indebtedness for deferred tuition or for loans from trust funds administered by the University which are protected by properly executed notes approved by the Comptroller.

EXPENSES

Necessary expenses for the collegiate year, clothing and traveling not included, are estimated at $600.00 in addition to tuition.

The University dormitories accommodate 172 students. The charge for single rooms is $50.00, $65.00, or $80.00 a year; suites of three or four rooms rent at $100.00 or $120.00 for each occupant. Applications for rooms in the University dormitories should be filed with the Bursar.

A cafeteria is located in Drown Memorial Hall. Numerous private householders in the city offer rooms and board at

moderate prices. Information concerning such rooms and board may be obtained from the Secretary of the Bureau of Student Employment and Housing.

Books, stationery, and drawing instruments may be purchased at low prices at the Supply Bureau in the Alumni Memorial Building.

CURRICULA OFFERED

Lehigh University offers the following curricula:

College of Arts and Science:

The Curriculum in Arts and Science

College of Business Administration:

The Curriculum in Business Administration

College of Engineering

The Curriculum in Chemical Engineering
The Curriculum in Chemistry
The Curriculum in Civil Engineering
The Curriculum in Electrical Engineering
The Curriculum in Engineering Physics
The Curriculum in Industrial Engineering
The Curriculum in Mechanical Engineering
The Curriculum in Metallurgical Engineering
The Curriculum in Mining Engineering

THE COLLEGE OF ARTS AND SCIENCE

The curriculum of the College of Arts and Science is based upon the general principles of distribution and concentration. The object of the distribution requirements is to insure that the student is provided with at least an elementary knowledge of those fields which form the basis of contemporary thought and to help orient him in the world of man and nature. These requirements are coordinated so far as possible with the work of the preparatory schools, the number and nature of the prescribed courses to be taken in college being dependent upon the subjects presented for entrance.

The number of elective courses depends on the individual's distribution requirements but the work is so arranged that at least one free elective is open to every freshman. Well prepared freshmen have greater freedom in the choice of electives. In the succeeding years the number of free electives increases, being limited solely by the demands of the major work and the number of courses allowed the student per semester. Electives in the freshman and sophomore years should be used as orientation courses, i.e., for the purpose of enabling the student to discover his major interests. In the last two years the selection of electives will be determined entirely by the individual student's personal choice.

The object of the concentration or major requirement is to enable the student to capitalize his interests and get a thorough foundation in some particular field.

The minimum course of study comprises fifteen scholastic hours or periods weekly. Work is assigned on the assumption that two hours are required by the average student to prepare adequately for a recitation. Students of proved ability, however, are not limited to this minimum. In general, the College aims at a reasonable amount of work well done, rather than a large amount indifferently done.

Instruction is given by lectures, by recitations, by the assignment of readings and topics for study and report, and, when the subject admits of it, by practical work in

field or laboratory. Field work or laboratory work accompanies courses in geology, physics, chemistry, biology, psychology, and allied subjects. Practice in teaching is provided in the schools of the vicinity for those who expect to follow teaching. Students residing in Leonard Hall, who are preparing under the direction of the Bishop of the Episcopal Diocese of Bethlehem for the theological seminary, have opportunity for practical religious work.

The degree of Bachelor of Arts is conferred upon graduates of the College of Arts and Science.

REQUIREMENTS FOR GRADUATION

Beginning with the class of 1933

1. The completion of 120 units or semester hours of academic work. These 120 hours must be apportioned so as to cover the distribution and concentration requirements.

2. Military Science and Tactics. All able-bodied students, citizens of the United States, must take eight semester hours of Military Science and Tactics in addition to the 120 semester hours of academic work.

3. Chapel. All students must elect Chapel during the freshman and sophomore years, or take two one-hour courses in Present-day Ethical Problems or Philosophy of Religion.

4. Physical Education. All students are required to take a course in Physical Education during each semester of residence.

5. Comprehensive Examination. All students must pass a comprehensive examination in the major field with a grade of not less than C.

DISTRIBUTION REQUIREMENTS

a. English. Twelve semester hours. These will ordinarily be English 1, 2, 4, and 5. Students who demonstrate satisfactory ability in written composition in their placement examinations may satisfy this English requirement by passing English 4 and 5 or an equivalent.

b. Foreign Language. A reading knowledge of Latin, Greek, French, or German and an elementary knowledge of a second of these is required of all students. The require-

ment takes into consideration work done in the preparatory schools and may be met in the following ways:

Reading Knowledge. Students may satisfy this requirement by examination; otherwise, students who offer three or four years of Latin, French, Greek, or German at entrance will satisfy this requirement by passing Latin 1, 2, Greek 5, 6, French 21, 22, or German 9, 10, in course; while those who offer only two years in Latin, Greek, French, or German will continue the language presented for two years. With the permission of the Director of the College such students may substitute one of the other three languages.

Students who offer two years of two or more languages, Latin, Greek, French, or German, may choose from these the language they are to continue.

Students who offer two or more years in Spanish only will take Latin, Greek, French, or German in college for two years in addition to the elementary requirement stated below.

Elementary Knowledge. The elementary knowledge may be established by examination at entrance or later or by passing Latin 31, 32, Greek 1, 2, French 1, 2, or German 1, 2, or any higher course in these languages.

c. Biology, Chemistry, Geology, Philosophy, Physics, and Psychology. Three semester hours each. These subjects must be taken by all students who present no entrance credits in them. If a student has received entrance credit for one year's work in any of these subjects, he may omit that subject from his requirement. This requirement may be met by taking specially designed introductory elementary courses in these subjects.

d. Mathematics and Astronomy. This requirement is as follows: Including the preparatory mathematics each student must present for graduation Elementary Algebra, Intermediate Algebra, Plane Geometry, Plane Trigonometry, and either Advanced Algebra or Solid Geometry or Astronomy. Unified Mathematics pursued in college may be substituted semester by semester for any of the last four subjects.

e. History. Nine semester hours. For each year of history for which a student receives entrance credit this distribution requirement will be reduced three hours.

Students who have had no course in ancient history at entrance are required to take at least three semester hours in ancient history in college.

f. Economics. Six semester hours in economics are required of all students who have not had at least one full year of economics in the preparatory school.

Distribution requirements except economics should be met during the freshman and sophomore years. The assignment of the courses covering the distribution requirement of the individual student is made by the Director of the College.

CONCENTRATION REQUIREMENTS—MAJORS

During the second semester of the freshman year each student must select some sequence of studies as his major field. A major consists of at least twelve semester hours of advanced work in the field chosen. Including preliminary college work the minimum number of hours constituting a major is 24. Change of major will be permitted up to the end of the sophomore year. Majors must be approved by the professors concerned and the Director of the College.

The major work is designed to enable a student to master his chosen field so far as that is possible in the two years devoted to the subject. In all fields certain courses are prescribed but the mere passing of courses will not satisfy the major requirement. It is expected that the student will read widely in his subject and prepare himslf largely through his own reading and his own independent work for his final comprehensive examinations. Such guidance as he may need from time to time will be furnished by his major adviser. Details concerning the major requirements are to be found in the printed Major Pamphlet.

A comprehensive examination in the major subject is required of all students. This examination is given at the end of the senior year and may be oral or written or both. The comprehensive examinations are given under the direction of the head of the major department. At least two

university teachers and, whenever possible, representatives of at least two departments take part in the examinations.

No student will be recommended for graduation who does not attain a grade of at least C in the final comprehensive examination.

After a student has selected a major subject, the head of the department in which the major is selected becomes the official adviser of the student and guides him in his choice of electives.

Students who are preparing for engineering curricula should consult the Director of the College of Arts and Science before selecting a major sequence.

The Director of the College of Arts and Science may be consulted at any time concerning the major requirements.

On the advice of the head of the department in which the major work is being done and with the consent of the Director of the College, a senior of unusual merit who wishes to concentrate in his chosen field may be allowed to substitute not more than six hours of unscheduled work per semester for six hours of elective work otherwise required for graduation.

SPECIAL HONORS (HONORS IN MAJORS)

Special Honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the Faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for Special Honors must indicate during the first semester of the junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned, and the general proficiency of the candidate as evidenced by either a final examination or a thesis, as the head of the department involved may direct. Special Honors are announced at Commencement.

SPECIAL REGULATIONS FOR ENGLISH

Students in the College of Arts and Science who persistently use poor English may be reported at any time to the Director of the College who may require that they take ad-

ditional English without credit toward graduation. Toward the end of the junior year each junior in the College of Arts and Science must report to the Department of English for an exercise in impromptu writing. Students who are found to be seriously deficient in this test will be reported to the Director of the College who may require that they take additional English without credit toward graduation.

ELECTIVE STUDIES

1. Courses open to freshmen as electives.

FRESHMAN ELECTIVES

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Biol. 1	Intro. to Biology.	3	Astr. 1	Descriptive Astr.	3
Bus. 1	Ind. Evolution	3	Biol. 2	Mam. Anatomy	2
Chem. 1	Elem. Chemistry.	2	Biol. 3	Comp. Anatomy	3
Chem. 3	Inter. Chemistry.	2	Biol. 6	Botany	3
Chem. 11	Chemistry Lab.	2	Biol. 9	Genetics	1
Chem. 12	Chemistry Lab.	1	Bus. 2	Ind. Evolution	3
Chem. 13	Chemistry Lab.	2	Chem. 1	Elem. Chemistry.	2
Chem. 14	Chemistry Lab.	1	Chem. 8	Stoichiometry	1
Engl. 3a	Eng. Comp. & Lit.	3	Chem. 11	Chemistry Lab.	2
Engl. 4	Drama	3	Chem. 20	Qual. Analysis	3
Engl. 10	Intro. Pub. Speak.	3	Engl. 3b	Eng. Comp. & Lit.	3
F.A. 5	Freehand Draw.	3	Engl. 5	Drama	3
Fr. 1	Elem. French	3	Engl. 11	Pub. Speaking	3
Fr. 11	Inter. French	3	F.A. 6	Freehand Draw.	3
Fr. 21	Adv. French	3	Fr. 1	Elem. French	3
Geol. 3, 6	Intro. to Geology.	3	Fr. 2	Elem. French	3
Ger. 1	Elem. German	3	Fr. 12	Inter. French	3
Ger. 3	Inter. German	3	Fr. 22	Adv. French	3
Ger. 9	Adv. German	3	Geol. 4, 6	Gen. Geology	3
Gk. 1	Elem. Greek	3	Geol. 5	Historical Geol.	3
Gk. 3	Inter. Greek	3	Ger. 1	Elem. German	3
Gk. 5	Adv. Greek	3	Ger. 2	Elem. German	3
Hist. 13	U.S. History	3	Ger. 4	Inter. German	3
Hist. 25	European History	3	Ger. 10	Faust	3
Ital. 1	Elem. Italian	3	Gk. 2	Elem. Greek	3
Lat. 1a	Pliny, Martial, Vergil	3	Gk. 4	Inter. Greek	3
			Gk. 6	Adv. Greek	3
Lat. 1b	Vergil, Ovid	3	Hist. 14	U.S. History	3
Lat. 21	Ancient History.	3	Hist. 26	European History	3
Lat. 31	Elem. Latin	3	Ital. 2	Elem. Italian	3
Lat. 33	Inter. Latin	3	Lat. 2	Horace	3
Math. 1	Plane Trig.	3	Lat. 22	Ancient History.	3
Math. 1a	Unified Math.	3	Lat. 32	Cæsar	3
Math. 1b	Solid Geometry.	3	Lat. 34	Cicero	3
Math. 2	Algebra	3	Math. 1	Plane Trig.	3
Phil. 3	Intro. Philosophy	3	Math. 2	Algebra	3
Phil. 5	Phil. of Religion	1	Math. 2a	Unified Math.	3
Phil. 11	Ethics	1	Math. 3	Anal. Geometry	3
Psych. 5	Intro. to Psychol.	3	Math. 16	Solid Geometry.	3
Phys. 12	Intro. to Physics	3	Phil. 3	Intro. Philosophy	3
Span. 1	Elem. Spanish	3	Phil. 6	Phil. of Religion	1
Span. 11	Inter. Spanish	3	Phil. 12	Ethics	1
Span. 21	Adv. Spanish	3	Psych. 5	Intro. to Psychol.	3
			Phys. 13	General Physics.	3
			Span. 1	Elem. Spanish	3
			Span. 2	Elem. Spanish	3
			Span. 12	Inter. Spanish	3
			Span. 22	Adv. Spanish	3

2. Sophomores, juniors, and seniors may elect in general any courses offered by the College of Arts and Science for which they have the prerequisites. Elementary courses intended primarily for freshmen and sophomores may not be taken for graduation credit by juniors and seniors without the consent of the Director of the College and the student's major adviser.

THE CURRICULUM IN ARTS AND SCIENCE

For Classes of 1930, 1931, and 1932

FRESHMAN YEAR

FIRST SEMESTER

Number	Title	Cr.Hrs.
Engl. 1	English	3
Math. 1a	Unified Math.	3
Math. 2a	or Un. Math.	
Ger. 5 or 1	German	3
Fr. 11	or French	
Lat. 1, 31, or 33	Latin	3
Lat. 21	or Anc. Hist.	
Gk. 5 or 1	Greek	3
Chem. 1 or 3	or Chem. ..2	
Chem. 12 or 14	& Chem. Lab. 1	
Phys. 12	or Physics	
Mil. 1	M. S. & T.	2
P.E. 1	Physical Ed.	—
Chap. 1	Chapel	—
Phil. 5	or Phil. Rel. 1	
Phil. 11	or Eth. Probs. 1	
		17

SECOND SEMESTER

Number	Title	Cr.Hrs.
Engl. 2	English	3
Math. 2a	Unified Math.	3
Astr. 1	or Des. Astr.	
Math. 3	or Anal. Geom.	
Math. 16	or Sol. Geom.	
Ger. 6 or 2	German	3
Fr. 12	or French	
Lat. 2, 32, or 34	Latin	3
Lat. 22	or Anc. Hist.	
Gk. 6 or 2	Greek	3
Chem. 21	or Qual. An. 2	
Chem. 8	& Stoich. ..1	
Phys. 13	or Physics	
Mil. 2	M. S. & T.	2
P.E. 2	Physical Ed.	—
Chap. 2	Chapel	—
Phil. 6	or Phil. Rel. 1	
Phil. 12	or Eth. Probs. 1	
		17

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3
Engl. 4 or 6	English	3	Engl. 5 or 7	English	3
Ger. 1, 3, or 9	German	3	Fr. 2 or 22	French	3
Fr. 1 or 21	French	3	Ger. 2, 4, or 10	German	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
	Electives	3		Electives	3
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*Chap. 3	Chapel	—	*Chap. 4	Chapel	—
		17			17

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Biol. 1	Biology	3	Geol. 4	Geology	2
Psych. 1	Psychology	3	Geol. 6	Geology Trips	1
Fr. 11	French	3	Psych. 2 or 4	Psychology	3
Ger. 3	or German		Fr. 12	French	3
	Electives	6	Ger. 4	or German	
P.E. 5	Physical Ed.	—		Electives	6
			P.E. 6	Physical Ed.	—
		15			15

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Phil. 1	Philosophy	3	Phil. 2	Philosophy	3
	Electives	12		Electives	12
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		15			15

* Taken by students who elect Chap. 1 and 2 during the freshman year.

PREPARATION FOR ENGINEERING

If a student in the College of Arts and Science contemplates becoming a candidate for a degree in engineering after the completion of his B.A. curriculum, he should choose as electives in his third and fourth years such science studies as are contained in the first and second years of the engineering curriculum which he wishes afterwards to complete. By carefully selecting electives, with the advice and guidance of the director of his curriculum and the professor in charge of the engineering curriculum concerned, the graduate of the B.A. course may enter the engineering curriculum chosen as a junior in full standing, and obtain his engineering degree in two years of further study.

PREPARATION FOR MEDICINE

Students in the College of Arts and Science who are preparing to enter a medical school must meet the regular requirements for distribution and concentration. In the course of the four years they must elect the following courses prescribed by the college to meet the demands of the medical schools:

Biology 1	Introduction to Biology	3
Biology 2	Mammalian Anatomy	2
Biology 3	Comparative Anatomy	3
Biology 4	Vertebrate Embryology	3
Biology 9	Genetics	1
Biology 54	Bacteriology	3
Chemistry 1	Elementary Chemistry	2
Chemistry 11	Chemistry Laboratory	2
Chemistry 8	Stoichiometry	1
Chemistry 20	Qualitative Analysis	3
Chemistry 6	Advanced Chemistry	3
Chemistry 7	Advanced Chemistry	3
Chemistry 30	Quantitative Analysis	3
Chemistry 41	Quantitative Analysis Conference	1
Chemistry 160	Organic Chemistry	4
Chemistry 165	Organic Chemistry Laboratory	2
Chemistry 161	Organic Chemistry	3
Chemistry 166	Organic Chemistry Laboratory	3
Physics 12	Introduction to Physics	3
Physics 13	General Physics	3
Physics 14	General Physics	3
Physics 15	Modern Physics	3

Chem 31 Quant. Anal. (5)
Chem 45 Quant. Anal Conf (1) } Alternate

Students preparing for Medicine should major in Biology or Chemistry. Professor R. W. Hall is the official adviser of students preparing for Medicine.

PREPARATION FOR TEACHING

Students who expect to teach upon graduation should consult with the Department of Education early in their college course. A license or certificate is required of every one who teaches in the public schools of Pennsylvania or of any other state. The approved certificate in Pennsylvania for college graduates is the College Provisional Certificate granted upon completion of eighteen semester hours of professional or pedagogical courses and a minimum of twelve semester hours in each subject which the candidate expects to teach. With the completion of three years of successful teaching and additional preparation amounting to six semester hours the certificate is made permanent. These eighteen semester hours of professional studies are apportioned as follows:

Introduction to Teaching (3)	cf Educ. 1
Educational Psychology (3)	cf. Psych. 2
Practice Teaching (6)	cf. Educ. 15 and 16
Elective studies (6)	Educ. 2, 7, 8, 10, 109, 111, 114 and Psych. 103 and 113 are suitable, also special method courses.

The requirements for certification in other states are similar to those in Pennsylvania, with minor differences.

Attention is drawn to the regulations concerning the selection of a major study, as outlined in the foregoing description of the curriculum in Arts and Science. The student who is preparing to teach should major in either the subject he prefers to teach or Education. Special method courses may be taken in the several departments that deal with the subject matter of school instruction: language, science, etc. Practice teaching is done mainly in the Bethlehem High School; but observation, practice, and substitute teaching may be done in elementary schools in Bethlehem and elsewhere. The Department of Physical Education offers courses which should appeal to students who anticipate coaching and supervision of physical education. Courses offered by the Department of Education are essential for public school teachers of physical education.

Teacher Placement Committee

The Teacher Placement Committee is charged with placing qualified Lehigh graduates who wish to teach. The University gives its official recommendation of a candidate only through this committee. Students who desire to teach should call upon the secretary of the committee, Assistant Professor Drown, for advice and direction. No fees are charged; the service is available for every Lehigh student.

THE COLLEGE OF BUSINESS ADMINISTRATION

The first function of the College of Business Administration is to provide for students intending to enter business rather than the professions thorough training in the principles which underlie all business activity. With this end in view the College offers a four-year curriculum which covers the fundamental economic principles that control the growth and operation of industrial and commercial enterprises, the general laws that determine economic progress, and the basic facts of accounting, finance, and statistics that are applicable to all business.

The curriculum does not pretend to equip students for the management of enterprises or the holding of responsible business positions immediately after graduation. The College of Business Administration makes no attempt to provide a substitute for the training and experience in the complex details of any particular business that can be gained only from actual contact with that business. The primary aim is to develop in the student an intelligent understanding of forces and principles, an ability to analyze industrial and commercial phenomena, and a habit of thought that will enable him in later life to cope with the problems which increasing executive responsibility will bring. Above all the curriculum is intended to give the student such familiarity with various types of business that he can intelligently choose the special branch in which he is most likely to succeed without trusting to the fortuitous hazards of personal connections and opportunity.

In accordance with this plan of training in fundamentals the curriculum in Business Administration is more rigidly outlined than the ordinary curriculum of this type, with less opportunity than is customary for a narrow specialization in a technical field and more emphasis on general social and economic subjects. The student who is especially interested in some such field of work as accounting or finance or industrial administration is given every opportunity to specialize in that field, but the curriculum does not permit specialization at the expense of the work in the fundamentals of industrial history, economic development, and social problems.

The freshman year is largely devoted to the work in science, mathematics, English, and languages which is essential as a background for the specialized work of the later years. There is an introductory course which outlines the development of economic life. The sophomore year takes up the work in economic principles and accounting, the two courses serving as a foundation for all subsequent courses in business. The junior and senior years are devoted chiefly to technical business courses, with sufficient freedom of choice to permit the student to follow his special interests.

A second function of the College of Business Administration is to afford to students in the College of Arts and Science and in the various engineering curricula of the University an opportunity to receive instruction in the fundamental facts and principles of economics, now generally included in the curriculum of all college students, whether in the more generalized cultural curricula or in the highly specialized professional engineering fields. A special service in this connection is the provision of courses in the curriculum in Industrial Engineering.

Graduates of this curriculum receive the degree of Bachelor of Science in Business Administration.

THE CURRICULUM IN BUSINESS ADMINISTRATION

FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Bus. 1	Ind. Evolution	3	Bus. 2	Ind. Evolution	3
Engl. 1	English	3	Engl. 2	English	3
Math. 1	Trigonometry	3	Math. 2	Algebra	
Math. 2	or Algebra		Math. 3	or Anal. Geom.	3
Fr. 1 or 11	French		Astr. 1	or Des. Astr.	
Ger. 1 or 5	or German	3	Math. 16	cr Sol. Geom.	
Span. 1 or 11.	or Spanish		Fr. 2 or 12	French	
Chem. 1 or 3	Chemistry 2		Ger. 2 or 6	or German	3
Chem. 12 or 14.	& Chem. Lab. 1		Span. 2 or 12.	or Spanish	
Biol. 7	or Biology	3	Chem. 21	Qual. Anal....2	
Geol. 16	or Physiog.		Chem. 8	& Stoich....1	
Phys. 12	or Physics		Biol. 8	or Biology	3
Mil. 1	M. S. & T.	2	Geol. 17	or Physiog.	
P.E. 1	Physical Ed.	—	Phys. 13	or Physics	
Chap. 1	Chapel		Mil. 2	M. S. & T.	2
Phil. 5	or Phil. Rel. 1	—	P.E. 2	Physical Ed.	—
Phil. 11	or Eth. Probs. 1		Chap. 2	Chapel	
			Phil. 6	or Phil. Rel. 1	—
			Phil. 12	or Eth. Probs. 1	
		17			17

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3
Bus. 11	Accounting	3	Bus. 12	Accounting	3
Hist. 13	U.S. History	3	Hist. 14	U.S. History	3
Psych. 10	Psychology	3	Psych. 15	Ind. Psychology	3
Fr. 11 or 21	French		Fr. 12 or 22	French	
Ger. 3 or 9	or German	3	Ger. 4 or 10	or German	3
Span. 11 or 21	or Spanish		Span. 12 or 22	or Spanish	
Engl. 4, 6, or 10	or English		Engl. 5, 7, or 11	or English	
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*Chap. 3	Chapel	—	*Chap. 4	Chapel	—
		17			17

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 21	Corp. Finance	3	Bus. 22	Corp. Finance	3
Bus. 29	Money & Banking	3	Bus. 30	Money & Banking	3
Bus. 49	Econ. Geography	3	Bus. 50	Econ. Geography	3
Govt. 51	American Govt.	3	Govt. 52	American Govt.	3
Bus. 13	Adv. Accounting		Bus. 14	Adv. Accounting	
Bus. 33	or Labor	3	Bus. 38	or Transport.	3
Math. 41	or Math. of Fin.		Math. 42	or Math. Stat.	
	Electives	3		Electives	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 45	Statistics	3	Bus. 46	Business Cycles	3
Bus. 161	Sociology	3	Bus. 162	Sociology	3
Any two of the following:			Any two of the following:		
Bus. 39	Ind. Management		Bus. 40	Ind. Management	
Bus. 57	Marketing		Bus. 56	Business Law	
Bus. 107	Adv. Economics	6	Bus. 108	Adv. Economics	6
Bus. 115	Cost Accounting		Bus. 116	Acct. Systems	
Bus. 123	Investments		Bus. 126	Public Finance	
	Electives	6		Electives	6
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		18			18

Options and free electives in Business Administration must be approved by the Director of the curriculum.

* Taken by students who elect Chap. 1 and 2 during freshman year.

THE COLLEGE OF ENGINEERING

General Statement

The College of Engineering offers courses of study in Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Engineering Physics, Industrial Engineering, Mechanical Engineering, Metallurgical Engineering, and Mining Engineering.

The Curricula

The engineering curricula were formulated on the basis of an intensive study, by the Faculty of Lehigh University, of the problems of technical education and the changing needs of modern industry. This study led to the conclusions that greater emphasis than heretofore should be placed upon the fundamentals of engineering, including mathematics, physics, chemistry, and theoretical and applied mechanics, and less emphasis upon the highly specialized details of engineering practice; and that the engineer must know something of the social sciences, that is, the sciences which deal with human relations, and be familiar with the methods of business organization and administration. The various engineering curricula are arranged accordingly, to increase the time devoted to fundamentals and also the time devoted to nontechnical subjects, which are a part of the equipment of every well educated man and which are now recognized as essential to the proper training of engineers because of their practical applications in industrial and business life.

Among the noteworthy features of the curricula the following may be mentioned:

(1) Provision is made for a uniform freshman year in the College of Engineering, so that no student is required to select his course of study until he is better prepared, after a year of college work, to choose wisely. The requirements in the sophomore year for the various curricula are similar although not entirely uniform. A student can, therefore, change from one curriculum to another at the close of the second year with little difficulty.

(2) The work of the first two years is fairly self-contained. To those who for one reason or another are unable to complete their engineering training, it affords preparation for careers as draftsmen, electricians, surveyors, shop foremen, or assistants in industrial laboratories or plants. Students who complete successfully the work of the first two years without conditions or failures and who then withdraw from the University are given a certificate of work completed.

(3) At the close of the second year a comprehensive examination is required on the work of the first two years; and a student's admission to the junior class is based upon (a) his scholastic record for the first two years, (b) the results of his comprehensive examination, and (c) his aptitude for engineering work as determined by his instructors' estimates of his ability to think, of his interest in the subjects taken, and of his accuracy and industry.

(4) Since the University recognizes that an engineer cannot be trained by purely academic process, the degree awarded upon graduation is Bachelor of Science in the particular division of engineering that has been studied, for example, B.S. in Civil Engineering. The successful completion of one year of graduate study leads to the degree of Master of Science in the particular division of engineering studied.

(5) Professional engineering degrees such as Civil Engineer (C.E.), Mechanical Engineer (M.E.), etc., are awarded to graduates of Lehigh University having the degree of Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, etc., who have had not less than five years of acceptable practical experience in responsible charge of work after graduation, and who submit a suitable thesis.

Engineering Conferences

Throughout the freshman year weekly conferences are held by the directors of curricula, to which groups of students must go in turn for orientation, motivation, and vocational guidance. During the sophomore year these conferences are continued in the curriculum of the student's choice. By means of these conferences and by the appraisal made by each instructor

throughout the freshman and sophomore years, an estimate of the student's aptitude for further engineering work is attempted.

Selection of Specialized Curricula

In the spring of his freshman year each engineering student must announce his selection of the particular engineering curriculum which he desires to continue. This announcement must be made by members of the class of 1933 not later than April 15, 1930.

Options at the End of the Sophomore Year

At the end of the sophomore year three avenues are open to the students:

(1) They may continue the curriculum elected, provided (a) that they have acquired the necessary scholastic record; (b) that they pass the required comprehensive examination on the work of the first two years; (c) that they have exhibited the necessary aptitude for the work of their choice.

(2) They may transfer to other curricula in engineering, to the College of Arts and Science, or to the College of Business Administration, provided: (a) that they have acquired the necessary scholastic record; (b) that they have exhibited the necessary aptitude for the work of their choice.

(3) They may withdraw with a certificate of completion of two years' work, provided that they have satisfactorily completed all of the work of the first two years.

The Uniform Freshman Year

An outline follows of the work of the freshman year, uniform for all engineering students. For descriptions of the work of the upper three years, varying according to the several specialized curricula, see the subsequent pages.

ALL ENGINEERING CURRICULA

FRESHMAN YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 1 or 3	Chemistry	2	Chem. 8	Stoichiometry	1
Chem. 11 or 13	Chemistry Lab.	2	Chem. 20	Qual. Analysis	3
C.E. 1	Drawing	2	C.E. 2	Drawing	2
Engl. 1	English	3	Engl. 2	English	3
Math. 2	Algebra	3	Math. 3	Analytic Geom.	3
Phys. 1	Gen. Physics	4	Math. 20	Mechanics	4
Math. 20	or Mechanics.		Phys. 1	or Gen. Phys.	
Mil. 1	M. S. & T.	2	Mil. 2	M. S. & T.	2
E.C. 1	Eng. Conferences	—	E.C. 2	Eng. Conferences	—
P.E. 1	Physical Ed.	—	P.E. 2	Physical Ed.	—
Chap. 1	Chapel	—	Chap. 2	Chapel	—
Phil. 5	or Phil. Rel. 1		Phil. 6	or Phil. Rel. 1	
Phil. 11	or Eth. Probs. 1		Phil. 12	or Eth. Probs. 1	
		18			18

Summer Session

For students who at the end of the freshman year elect Electrical Engineering, Engineering Physics, Industrial Engineering, Mechanical Engineering, or Metallurgical Engineering: C.E. 6, Land and Topographic Surveying, four weeks, 4.

For students who elect Civil Engineering or Mining Engineering: C.E. 6, Land and Topographic Surveying, four weeks, 4; and C.E. 7, Railroad Surveying, two weeks, 2.

There is no required work in the summer following the freshman year for students who elect Chemical Engineering or Chemistry.

THE CURRICULUM IN CHEMICAL ENGINEERING

The curriculum in Chemical Engineering is designed to prepare the student for the profession of chemical engineer, which includes the design, construction, and management of manufacturing establishments in which new substances are produced. Such substances are paper made from wood, gasoline from petroleum, acids, dyes and other synthetic products, glass, photographic films, and hundreds of other substances which are part of our daily life. The chemical engineer may choose his initial employment in laboratory work or he may keep scientific oversight of machinery and processes in plant operation. He should ultimately rise to general superintendencies and higher responsibilities. Aside from the primary requirement of chemistry, the modern chemical engineer needs a thorough knowledge of physics and mathematics, together with a sound understanding of such fundamentals in chemical, mechanical, and electrical engineering as will make him a discriminating research and operating engineer.

The following descriptions of chemistry studies apply to these subjects in the curriculum in Chemistry and in the curriculum in Chemical Engineering.

Elementary Chemistry, begun in the freshman year, is taught through lectures and demonstrations, supplemented by experiments in the laboratory which develop manipulative skill and make careful observation habitual. An alternate course, less elementary in both class room and laboratory, is given to entering students who have had a considerable training in elementary chemistry.

After this preliminary view of the elements of chemistry, there is developed that deeper insight into the changes of matter which is the particular province of general chemistry. In Advanced Chemistry of the first semester in the sophomore year additional attention is paid to the modern theories and concepts of chemistry, including solution, equilibrium and energy relations of molecules and of atoms, radio-activity, etc.,—a kind of junior physical chemistry of the greatest everyday importance in chemical engineering. Continued through the second semester, this subject covers a moderately advanced study of chemical substances and their preparation and proper-

ties, together with an elementary consideration of phase rule and of such general applications as the relations underlying desirable properties in metallic alloys, iron and steel, etc.

Organic Chemistry, taught during the entire junior year, acquaints the student with the simple compounds of carbon, and with the usefulness of this branch of chemistry in science, in the chemistry of animal and plant life, and in the manufacture and research investigation of such chemical products as synthetic dyes, drugs and medicines, varnishes, artificial silk, and many other products.

A course of lectures of two hours a week on Advanced Organic Chemistry is offered in the first half of the senior year to students who have shown ability in the Organic Chemistry and Organic Chemistry Laboratory of the junior year. As an alternate with Advanced Organic Chemistry the student may elect Industrial Biochemistry, which has to do with the chemistry of life processes and of products derived from living things. Those expecting to elect Tanning Technology as a graduate study should choose this course.

An introduction to the chemistry of metals and to the chemical analysis of substances is given through the course designated as Qualitative Analysis in the second semester of the freshman year. The simpler mathematical relations of chemical processes are reviewed under Stoichiometry and are illustrated through many problems solved by the student. Quantitative Chemical Analysis by gravimetric, volumetric, and electrolytic methods, which continues through the sophomore year, takes up the analysis of ores, fuels, metallurgical products, commercial chemicals, and by-products. Frequent class room conferences consider the calculations involved in and the scientific foundations of quantitative analysis. The analysis of industrial organic substances and of food-stuffs and drinking and boiler waters is placed in the final semester of the senior year, when the student has a better foundation in Industrial Chemistry.

Fire-assaying of ores and of gold and silver bullion is taught in a summer term of four weeks when continuous attention throughout the day can be given to muffles and furnaces. The tests necessary for a valuation and understanding of coal, gas, and petroleum are studied in the same summer term, and include the calorimetry of fuels.

The laboratory methods of physical chemistry and the systematic deeper study of the generalizations of chemistry learned in the sophomore year are reserved for the senior year under Physical Chemistry and Electrochemistry. Interrelations of the fundamentals of matter and energy are developed under such cognate headings as two-phase and multiphase systems, thermodynamics, gas reactions, mass action, electrochemistry, colloid chemistry, etc. Attention is given to the usefulness of physical chemistry and electrochemistry in the solution of manufacturing problems in chemical engineering and industrial chemistry.

Intensive instruction in the application of factory methods in chemical engineering is placed in the junior and senior years and is grouped under Chemical Engineering, Chemical Engineering Laboratory, and Chemical Engineering Practice. The processes reviewed are varied; such as transportation of gases, liquids, and solids; grinding and pulverizing; mechanical, hydraulic, and pneumatic separation; evaporation; distillation; filter pressing; centrifuging; autoclaving; fuel technology and combustion engineering. The characteristics and adaptability of engineering materials used in apparatus and machines receive full discussion. Selected industries are investigated and explained. Familiarity with manufacture in its scientific and economic aspects is promoted in special laboratories fitted with industrial apparatus, the student finally submitting full working specifications for a plant designed for the preparation of some industrial product, together with estimates of cost of raw material and the cost of conversion into the finished product. Brief practice in leveling and transit work leads to some comprehension of the application of surveying in lay-out of industrial plant. Lehigh University is fortunately situated in the Lehigh Valley, abounding in business enterprises which involve chemical engineering. Many diversified factory processes are in operation within ten minutes' drive of the University and this variety is greatly extended within half an hour's drive. Visits are also made to factories in the nearby cities of Philadelphia and New York.

In Research Chemistry in the senior year every student is required to solve a novel problem having a scientific basis, and is expected to demonstrate some ability as an independent research worker. The research involves an exhaustive search

for and study of the literature bearing on the subject in the University Library, including the patent literature. A short course in the History of Chemistry, with individual reading of significant records, coordinates the past progress of the science and leads to a nobler pride and an enhanced initiative in the profession which the graduate enters.

Metallurgy, taken in the Department of Metallurgy, gives special training in the principles and methods applied to the recovery of metals from their ores and to the manufacture and properties of iron and steel. Drawing is under the direction of the Department of Civil Engineering, as is the course in Mechanics of Materials, often called Strength of Materials. Instruction in mechanical engineering, so important to the chemical engineer, is given by the Mechanical Engineering Department. Training in mechanical engineering is afforded by the courses in Heat Engines of the junior year, and is continued in the Engineering Laboratory of the summer session following the junior year. Many of the problems and innovations of chemical engineering demand a more intimate knowledge of the principles and practice of electrical engineering than is given in the general course in physics; this is provided for in the junior year under the direction of the Department of Electrical Engineering. In Bacteriology, a lecture and laboratory course, a working knowledge is obtained of bacteriological methods as applied to water and some industrial products. The study of German, a necessary tool in current chemistry, is carried by all students in the sophomore year. Students who enter with German may elect Bacteriology in the junior year. An approach to problems of business is made in the course in Economics given by the College of Business Administration and further courses may be elected.

Electives in the senior year are absolutely free. Students whose previous record is high may at any time carry freely elected courses in addition to those regularly listed in the curriculum.

A scientific society is attached to the Department, with a membership of teachers and students, for the presentation of papers, the discussion of current journals, and the entertainment of speakers of note in the professions of chemistry and of chemical engineering.

The degree granted on completion of the curriculum is Bachelor of Science in Chemical Engineering.

THE CURRICULUM IN CHEMICAL ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Chem. 30	Quant. Analysis	3	Chem. 31	Quant. Analysis	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Ger. 1 or 5	German	3	Ger. 2 or 6	German	3
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 6	Elec., Mag. & Sound	3	Phys. 4	Mech., Heat & Light	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*Chap. 3	Chapel	—	*Chap. 4	Chapel	—
		19			19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas, and Oil Analysis, four weeks, 4.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3
Chem. 78	Chemical Eng.	3	Chem. 161	Organic Chem.	3
Chem. 160	Organic Chem.	4	Chem. 166	Org. Chem. Lab.	3
Chem. 165	Org. Chem. Lab.	2	E.E. 56	Electrical Eng.	2
Met. 23	Fer. Metallurgy	2	E.E. 57	Dynamo Lab.	1
Met. 83	Met. Problems	1	M.E. 29	Heat Engines	3
Ger. 7 / Biol. 52	German or Bacteriol.	3	Met. 24	Non-fer. Metal.	2
			Met. 84	Met. Problems	1
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		18			18

SUMMER SESSION: M.E. 24, Engineering Laboratory, 4 weeks, 4; or Mil. 9 or 19, Reserve Officers' Training Corps Camp for those who elect Advanced Military Science and Tactics, 3.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Chem. 162 / Chem. 168	Adv. Org. Chem. or Ind. Biochemistry	2	Chem. 99	Research Lab.	2
			Chem. 138	Ind. Org. Anal.	3
			Chem. 147	Ind. Anal. Conf.	1
Chem. 180	Chem. Eng. Lab.	3	Chem. 179	History of Chem.	1
Chem. 190	Physical Chem.	3	Chem. 181	Chemical Eng.	3
Chem. 192	Electrochemistry	1	Chem. 185	Chem. Eng. Prac.	1
Chem. 195	Phys. Chem. Lab.	1	Chem. 191	Physical Chem.	2
Chem. 197	Elec. Chem. Lab.	1	Chem. 196	Phys. Chem. Lab.	1
C.E. 9	Mech. of Materials	3		Elective	3
	Elective	3	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		17			17

* Taken by students who elect Chap. 1 and 2 during freshman year.

THE CURRICULUM IN CHEMISTRY

The chemist needs an uncommonly deep insight into the phenomena of matter and into the many processes in nature and in the arts in which matter undergoes change. The graduate in chemistry may use his education to discover and investigate, through research, hitherto unknown combinations of matter and of energy, or he may go forward in applying known facts and principles to new and useful purposes in manufacture or in the arts. In preparation for a professional career, the training is arranged to be thorough in fundamentals and to grow to a comprehensive understanding of the scientific and industrial achievements of chemistry.

The curriculum leading to the degree of Bachelor of Science in Chemistry offers an education primarily in chemistry, with considerable training in related sciences. The modern conception of an education in chemistry includes a simultaneous, thorough study of physics and mathematics. In addition to these so-called physical sciences, other studies, planned to aid and develop the thought-processes and culture of the student, are embodied in the curriculum. It is believed by many practicing chemists and chemical engineers that an undergraduate course such as this one embracing a liberal allotment of study in the humanities is the best preparation for a successful career both in pure science and in the business application of chemistry.

This curriculum and the curriculum in Chemical Engineering are both given under the direction of the Department of Chemistry and are administered as part of the College of Engineering. It is readily possible to change from one curriculum to the other at the end of either semester of the sophomore year. The freshman and sophomore years are the same for both curricula. The entrance subjects required are the same for both curricula, and the tuition and laboratory costs are practically the same. Subjects with the same titles in the tabulated curricula are given to students in both curricula simultaneously and under the same teachers, and are equal in content. A detailed statement about chemistry subjects is given in the description of the curriculum in Chemical Engineering.

The study of English is carried through the freshman year and is resumed in the junior year. French and German receive considerably more attention in this curriculum than in the curriculum in Chemical Engineering, as language tools for the working chemist and in their cultural aspects. Students who enter the University with German continue German through the sophomore year and take up French in the junior year. Those who offer French or Spanish as an entrance subject take German through the sophomore and junior years.

The prescribed course in Economics and elective business subjects are given in the College of Business Administration.

Geology is presented from its cultural viewpoint as a science and also in its economic relations.

Applications of the science of chemistry and the science of physics to industrial chemistry and chemical engineering are treated in the junior and senior years. The specific chemical engineering is taken with the students in the curriculum in Chemical Engineering and covers exactly the same ground. These courses offer a wide range of purely chemical engineering processes, which, together with description and reading in manufacturing procedure, afford a sound basis for a career in industry. The studies in chemical engineering practice cover the engineering features of a few industrial operations, critically analyzed and controlled under the immediate supervision of an expert. In order to acquaint the student intimately with factory method and personnel, a required summer term of work in factory or laboratory is set for part of the summer following the junior year.

Senior year electives allow of a wide choice of electives in engineering, science, arts, or business, and also permit absolutely free electives.

A student whose previous record is good may at any stage of his course carry additional freely elected subjects in any of the colleges of the University, and many young men avail themselves of this added opportunity for cultural development.

The foregoing curriculum and the curriculum in Chemical Engineering serve as excellent preparation for graduate study. Students who desire to go forward to the Master's degree (M.S.) will find information in regard to the requirements for that degree elsewhere in this Register.

THE CURRICULUM IN CHEMISTRY

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Chem. 6	Adv. Chemistry	3
Chem. 30	Quant. Analysis	3
Chem. 41	Quant. Anal. Conf.	1
Ger. 1 or 5	German	3
Math. 4	Elem. Calculus	3
Phys. 6	Elec., Mag. & Sound	3
Phys. 7	Physics Lab.	1
Mil. 3	M. S. & T.	2
E.C. 3	Eng. Conferences	—
P.E. 3	Physical Ed.	—
*Chap. 3	Chapel	—
		19

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Chem. 7	Adv. Chemistry	3
Chem. 31	Quant. Analysis	3
Chem. 45	Quant. Anal. Conf.	1
Ger. 2 or 6	German	3
Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3
Phys. 5	Physics Lab.	1
Mil. 4	M. S. & T.	2
E.C. 4	Eng. Conferences	—
P.E. 4	Physical Ed.	—
*Chap. 4	Chapel	—
		19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas, and Oil Analysis, four weeks, 4.

JUNIOR YEAR

FIRST SEMESTER

Bus. 3	Economics	3
Chem. 78	Chemical Eng.	3
Chem. 160	Organic Chem.	4
Chem. 165	Org. Chem. Lab.	2
Engl. 4 or 6	English	3
Ger. 3 / Fr. 1	German or French	3
P.E. 5	Physical Ed.	—
		18

SECOND SEMESTER

Bus. 4	Economics	3
Chem. 161	Organic Chem.	3
Chem. 166	Org. Chem. Lab.	3
Engl. 5, 11 or 41	English	3
Geol. 4	General Geology	2
Geol. 6	Field Trips	1
Ger. 4 / Fr. 2	German or French	3
P.E. 6	Physical Ed.	—
		18

SUMMER: Chem. 50, Work in industrial shops or chemical laboratory for eight weeks, with report; or Mil. 9 or 19, Reserve Officers' Training Corps Camp for those who elect Advanced Military Science and Tactics, 3.

SENIOR YEAR

FIRST SEMESTER

Chem. 162 / Chem. 168	Adv. Org. Chem. or Industrial Biochemistry	2
Chem. 180	Chem. Eng. Lab.	3
Chem. 190	Physical Chem.	3
Chem. 192	Electrochemistry	1
Chem. 195	Phys. Chem. Lab.	1
Chem. 197	Elec. Chem. Lab.	1
Any two of the following:		
Biol. 1	Biology	6
Biol. 52	Bacteriology	
Bus. 25	Corp. Finance	
Met. 23	Ferrous Met. . . 2	
Met. 83	& Met. Prob. 1	
Phys. 160	Physics Elective	
P.E. 7	Physical Ed.	—
		17

SECOND SEMESTER

Chem. 99	Research Lab.	2
Chem. 138	Ind. Org. Anal.	3
Chem. 147	Ind. Anal. Conf.	1
Chem. 179	History of Chem.	1
Chem. 181	Chemical Eng.	3
Chem. 185	Chem. Eng. Prac.	1
Chem. 191	Physical Chem.	2
Chem. 196	Phys. Chem. Lab.	1
Biol. 153	Adv. Bacteriol.	3
Bus. 18	or Accounting	
Met. 24	or Non-fer. Met. 2	
Met. 84	& Met. Prob. 1	
Phys. 161	or Physics	
	or Elective	
P.E. 8	Physical Ed.	—
		17

* Taken by students who elect Chap. 1 and 2 during freshman year.

THE CURRICULUM IN CIVIL ENGINEERING

The purpose of this curriculum is to give a broad education in those general and scientific subjects which form the foundation of all engineering, and a special training in the field of civil engineering, which covers the building of highways, railroads, harbors, docks and terminals, bridges, buildings, foundations, subways, tunnels, water supply and purification plants, sewerage systems and sewer disposal plants, water power development and surveys. The department aims to teach young men how to think and how to attack new problems, to impress upon them the underlying principles of engineering, and to inspire them with the desire to do their best work.

To enable the civil engineering graduate to deal with allied engineering problems arising in most civil engineering projects of today, the curriculum includes certain special studies such as dynamos and motors, alternating currents, heat engines, metallurgy, mineralogy, and geology. Courses in Business Administration, comprising economics, accounting, and finance, have been placed in the curriculum with the idea that the graduate should have a knowledge of the fundamentals of business. These business subjects should prove useful to young graduates whose advancement may be along sales, managerial, and executive channels. The Civil Engineering curriculum as a whole, including as it does mathematics, pure and applied science, general engineering, and business subjects, affords a thorough training in system, arrangement of work, accuracy in figures, and logical thinking, so that the student has the proper training to enter not only the engineering profession, but also any business organization, should he not care to follow strictly engineering work.

The first two years are devoted to fundamental studies which both give general culture and prepare for the technical work of the following years. These studies include the various branches of pure mathematics, physics, chemistry, English, modern languages, drawing, descriptive geometry, mineralogy, geology, and military science and tactics.

In the summer session, at the close of the freshman year, Land, Topographic, and Railroad Surveying is given. This course covers a period of six weeks, and by this arrangement

the attention of students is concentrated upon surveying, thus enabling practical field operations to be exemplified in the best manner. In Geodetic Surveying, given in the senior year, triangulations of a high degree of precision are executed. Determinations of azimuth and adjustments of results are made by standard methods. A large collection of levels, transits, and other surveying instruments enables the student to become familiar with the best type of apparatus.

Mechanics of Materials, which presents the theory of beams, columns, and shafts, and the method of computing and designing them, is given in the junior year. The course as here presented may be described as applied mechanics, that is, the application of mechanics to practical problems. Materials Testing Laboratory, paralleling Mechanics of Materials, is of great importance for the student's understanding of the mechanics of engineering and for the capacity it gives him to manipulate apparatus and to handle machines. Tests are made on the various materials used in construction.

Buildings and bridges receive attention throughout three semesters. Analytical and graphic methods of determining stresses are taken up in Stresses of the second semester of the junior year and in Structural Steel Design, Bridge and Building Construction, Foundations, and Higher Structures of the senior year. Visits are made to bridges and fabricating shops. In the senior year designs and working drawings are prepared by each student for both a highway and a railroad bridge. Some of these drawings are made in the same manner as in drawing rooms of bridge companies and others are general, that is, design drawings only. The theory of cantilever, draw, suspension, and arch structures receives detailed attention. Structural Steel Design as applied to building construction is studied in detail. The design and construction of reinforced concrete structures are given in the second semester of the senior year in the courses in Reinforced Concrete Design and Foundations. This extended training in structural engineering furnishes a foundation for structural steel and reinforced concrete work in practice.

Hydraulic Engineering and Sanitary Engineering are treated at length. The theory of the flow of water through orifices, weirs, pipes, and channels, together with the principles of

hydraulic motors, is given in the junior year, the work being supplemented by testing in the hydraulic laboratory. In the senior year the subjects of water supply, water power and sewerage are covered in detail. The methods of collecting, purifying, and distributing water are explained and compared; house drainage, the design of sewerage systems, and the disposal of sewage also receive attention. Computations of dams, stand-pipes, sewers, and other appurtenances are made. Canal engineering, river and harbor work, and land drainage are studied; irrigation by both water and sewage are discussed. The training in Hydraulics and sanitary engineering subjects, including Sanitary Bacteriology in the senior year, is planned to enable a graduate to enter upon the work of city engineering. In connection with the course in Hydraulics, measurements are made of the flow of the Lehigh River, the Lehigh Canal, and other streams in the vicinity of Bethlehem, and the data thus obtained are studied later and reports written thereon. In view of the increasing importance of water power development, this work is of value and interest.

The course in Highway Engineering covers a general discussion of roads and pavements, a study of traffic, both present and future, routes, financing, engineering, and construction. The design of rural highways and city streets is taken up in detail. Materials used in the road metal are discussed and compared, preliminary to a study of selection of type. Tests on both bituminous and non-bituminous materials are made in the Fritz Engineering Laboratory. Illustrated lectures on road materials are given throughout the semester. Inspection trips are made to points nearby, to view and study methods of design and construction.

The course in Railroads covers financing, surveying, economic location and construction, operation, yards, terminals, train resistances, and electrification.

During the first semester of the senior year, Contracts and Specifications is presented by the Civil Engineering Department more from the engineering than from the legal viewpoint. This course, consisting of three lectures a week, gives the essential features of contracts and the form and scope of contracts and specifications as used in building engineering work.

During the senior year an inspection trip is made to New York or Philadelphia for the purpose of viewing and studying engineering work, including construction. The trip is required of all students. The minimum expense is about $25.00.

A description of the Fritz Engineering Laboratory, which is operated by the Civil Engineering Department, is given in this Register under the heading of Buildings.

Graduates of this curriculum receive the degree of Bachelor of Science in Civil Engineering. Mature young men, if properly qualified, may take special studies without being candidates for the degree.

THE CURRICULUM IN CIVIL ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs.*
C.E. 11	Railroads	3	C.E. 16	Highway Eng.	3
Geol. 1a	Mineralogy	3	Geol. 4	Geology	2
Math. 4	Elem. Calculus	3	Geol. 6	Geology Trips	1
Phys. 6	Elec., Mag. & Sound	3	Math. 5	Appl. Calculus	3
Phys. 7	Physics Lab.	1	Phys. 4	Mech., Heat & Light	3
Engl. / Hist. 13 / Biol. 1	English or Foreign Language or History or Biology	3	Phys. 5	Physics Lab.	1
Mil. 3	M. S. & T.	2	Engl. / Hist. 14 / Psych. 5	English or Foreign Language or History or Psychology	3
E.C. 3	Eng. Conferences	—	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	E.C. 4	Eng. Conferences	—
*Chap. 3	Chapel	—	P.E. 4	Physical Ed.	—
			*Chap. 4	Chapel	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3
C.E. 8	Mech. of Materials	4	C.E. 12	Hydraulics	3
C.E. 10	Mat. Testing Lab.	1	C.E. 14	Hydraulics Lab.	1
E.E. 50	Dyn. & Motors	2	C.E. 15	Stresses	4
E.E. 51	Dynamo Lab.	1	E.E. 52	Alt. Currents	2
Math. 6	Adv. Calculus	3	E.E. 53	Dynamo Lab.	1
M.E. 29	Heat Engines	3	Math. 21	Anal. Mechanics	3
P.E. 5	Physical Ed.	—	M.E. 19	Engineering Lab.	1
			P.E. 6	Physical Ed.	—
		17			18

SUMMER: C.E. 29, Industrial employment for eight weeks on construction or in shop, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
C.E. 118	Str. Steel Design	4	Biol. 50	Sanitary Bac.	3
C.E. 119	Br. & Bldg. Constr.	2	Bus. 18	Accounting	3
C.E. 121	Hyd. & W.P. Eng.	4	C.E. 25	Foundations	2
C.E. 128	Sanitary Eng.	3	C.E. 125	Reinf. Concrete	3
Bus. 25	Corp. Finance		C.E. 126	Cem. & Con. Lab.	1
Psych. 5	or Psychology		Engl. 41 or 42	English	
Biol. 1	or Biology	3	Met. 24	or Met. 2	3
C.E. 27	or Con. & Spec.		Met. 84	& Met. Prob. 1	
Met. 21	Metallurgy 2		C.E. 123	R.R. & Term.	
Met. 81	& Met. Prob. 1	3	C.E. 124	or Higher Structures	
Astr. 2	or Astronomy				
Math.†		—	C.E. 122	or Geodesy	
P.E. 7	Physical Ed.	—	Astr. 3	or Prac. Astr.	3
			C.E. 131	or Adv. San. Eng.	
			C.E. 132	or Adv. Hwy. Eng.	
			C.E. 50	Thesis§	—
			Math.†		—
			P.E. 8	Physical Ed.	—
		19			18

* Taken by students who elect Chap. 1 and 2 during freshman year.

§ Thesis may be taken only by students of outstanding ability; in the majority of such cases it can be carried as an extra subject, not only in the second semester but also in the first.

† Students who have completed Math. 21 with high standing may elect Math. 111, 112, 122, 123, or 124 on approval of the Director of the Curriculum.

THE CURRICULUM IN ELECTRICAL ENGINEERING

The electrical engineer is one who understands the science and art of economically "directing the sources of electrical power in nature for the uses and conveniences of man." He may design, manufacture, install, or operate electrical machinery and appliances, manage plants and electric systems, or engage in the promotion of engineering projects. The demand for trained electrical engineers continues to grow faster than the supply. The graduate has a wide choice among the varied and increasing applications of electricity and promotion for the deserving is rapid.

The object of this curriculum is to give broad education in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical and business subjects which experience shows are most essential in the equipment of the electrical engineer. In seeking to accomplish this object the Department puts chief emphasis upon mastery of the mathematical-physical principles and thoroughness in the analysis of problems.

The curriculum includes a number of special studies in civil, mechanical, and metallurgical engineering, so that the graduate in electrical engineering is prepared not only to enter any of the branches of electrical engineering but also to deal with related problems in the other divisions of engineering. The electrical engineering graduate of today finds that professional advancement often lies through commercial, managerial, or executive channels. As superintendent or manager of electric light, power, or railway properties he must be prepared to handle problems involving not merely material and technical details but human relations, with workmen, capitalists, public utility commissioners, and the public. He must know something of the principles of accounting, economics, business law, and industrial management. A number of such studies have been introduced into the curriculum.

The fundamental studies are given in the early part of the curriculum and include mathematics, physics, chemistry, and English, or, if desired, a continuation of the modern language accepted for entrance. These subjects include the more es-

sential features of a broad education, and they furnish a preparation for the more advanced scientific and technical training to follow.

Work in applied electricity is pursued through the sophomore, junior, and senior years in the study of the Principles of Electrical Engineering, (theory of electricity and magnetism, dynamos and motors, theory of alternating currents, alternating-current machinery) with which are closely associated the laboratory problems and investigations.

The study of Electricity and Magnetism constitutes the application of the fundamental physical laws to the industrial uses of electricity. Physical principles as elucidated in physics are reviewed from the engineering viewpoint and applied to problems of an engineering nature.

The study of Dynamos and Motors includes the construction, operation, and control of direct-current generators and motors, with numerous illustrative problems. The study of dynamo-electric machinery is resumed during the senior year in connection with the subjects of Electrical Design (optional) and Alternating-current Machinery.

During the vacation following the junior year students are required to spend at least eight weeks in an electrical industrial plant or station; a written report on this work is made at the beginning of the next college year.

Fundamental subjects in mechanical engineering are required in this curriculum. Heat Engines includes the study of steam boilers, thermodynamics, steam engines, turbines, and gas engines. Engineering Laboratory is given throughout the senior year.

Important studies in civil engineering are included in this curriculum. Mechanics of Materials is concerned with the theory of beams, columns, and shafts and the methods of computing and designing them; the subject includes practical work in the testing laboratory. Hydraulics, including laboratory practice, treats of hydrostatics and theoretical hydraulics, the flow of water through orifices, weirs, pipes, and channels, naval hydromechanics, and hydraulic motors.

The study of General Metallurgy and Metallurgical Problems is given during the first semester of the sophomore year.

Advanced studies in electrical engineering follow the fundamental Principles of Electrical Engineering. The advanced electrical laboratory work is devoted to precise electrical measurements and the standardization and calibration of electrical measuring instruments. The Theory of Alternating Currents deals with the problems and methods of measurements which are peculiar to the modern practical applications of alternating currents and with the theory underlying the action of the important types of alternating-current machinery and transmission lines. Alternating-current Machinery includes the study of the construction and operation of alternating-current generators, motors, transformers, and other apparatus.

Dynamo laboratory work, beginning in the second semester of the sophomore year, is continued for five semesters. Instruction is based on a laboratory manual or notes supplemented by individual direction and supervision in the laboratory. The students work individually or in pairs, and make the more important tests on direct- and alternating-current generators and motors, synchronous converters, transformers, and other electrical apparatus. Written reports of all tests made, with curves plotted from the observations and discussion of results, are required. Throughout these courses the student is trained not only to perform the experimental work but also to plan and direct it.

Electrical Engineering Seminar continues throughout the senior year. The work consists of the presentation before the class of papers on assigned topics, supplementing the regular work of the class room. The Department reading-room is supplied with the leading electrical periodicals, American and foreign. The principal objects of the Seminar work are to encourage the systematic reading of the current engineering journals, the writing of papers in clear, cogent, non-technical English, and the verbal presentation of such papers before the staff and students.

Dynamo Testing, given by lectures and problems, treats of standard and special methods of making tests on dynamo machines, transformers, and other electrical apparatus.

Electric Stations takes up the location, design, and equipment of stations, the selection of suitable prime movers, gener-

ators, switchboards, and other apparatus. The cost of generating electric power and the various systems of rates receive consideration.

The subject of Electric Power Transmission deals with the various elements constituting a transmission system. It includes a study of the transmission line and the receiving systems. Special attention is given to the design, construction, and protection of the line. In the senior year a trip is taken on which visits of inspection are made to power plants, electrical laboratories, and telephone exchanges located in or about the city. This trip is required of all students who are candidates for a degree. The minimum expense is about $25.00.

Under Electric Traction as a senior option are studied the construction, equipment, and operation of different types of electric railways. The recent developments in the application of electric motive power to steam railroad conditions are discussed, and the results of tests are analyzed.

Electrical Design is optional in the first semester of the senior year. It includes the application of electric, magnetic, and mechanical principles to the design of various types of electrical apparatus. The instruction is given by recitations, problems, and drafting.

Electric Communication, a senior option, deals with telephone and telegraph systems, with special emphasis on matters of radio telegraphy and telephony, including the theory and operation of vacuum tube circuits. The laboratory work given in connection with this course includes the study of telephone transmission over an artificial telephone line and practical tests on the various radio circuits and apparatus.

Electric Transients, a senior option, deals with the transient phenomena occurring in the operation of generators, transformers, and transmission circuits and the relations of these phenomena to the protection of electric systems and apparatus.

Subjects in advanced mathematics or physics may be substituted, with permission from the Director of the curriculum, for the senior electrical options by such students as are deemed particularly qualified and who desire to continue for graduate work in electrical engineering here or elsewhere.

Graduates of this curriculum receive the degree of Bachelor of Science in Electrical Engineering.

Graduate study leading to the degree of Master of Science in Electrical Engineering is offered in the following majors: Design, Communications, Transients, and Power Transmission. The new James Ward Packard Laboratory offers excellent facilities for research in connection with the graduate study. Programs of instruction are arranged to fit individual graduate student needs. Minors are encouraged in physics and mathematics.

THE CURRICULUM IN ELECTRICAL ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs*
E.E. 1	Principles of E.E.	1	E.E. 2	Direct Cur. Mach.	3
M.E. 22	Heat Engines...	3	E.E. 3	Elem. Dyn. Lab.	1
Math. 4	Elem. Calculus..	3	Math. 5	Appl. Calculus...	3
Met. 21	Metallurgy	2	M.E. 23	Heat Engines...	3
Met. 81	Met. Problems...	1	Phys. 4	Mech., Heat & Light	3
Phys. 6	Elec., Mag. & Sound	3	Phys. 5	Physics Lab.	1
Phys. 7	Physics Lab.	1	Engl.	English or Foreign Language	3
Engl.	English or Foreign Language	3	Mil. 4	M. S. & T.	2
Mil. 3	M. S. & T.	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed. ...	—
P.E. 3	Physical Ed. ...	—	*Chap. 4	Chapel	—
*Chap. 3	Chapel	—			
		19			19

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER *Number*	*Title*	*Cr.Hrs.*	SECOND SEMESTER *Number*	*Title*	*Cr.Hrs*
Biol. 1	Biology	3	Bus. 4	Economics	3
Bus. 3	Economics	3	C.E. 13	Hydraulics	2
C.E. 9	Mech. of Materials	3	C.E. 14	Hydraulics Lab..	1
C.E. 10	Mat. Testing Lab.	1	E.E. 6	Alt. Currents....	3
E.E. 4	Alt. Currents....	3	E.E. 8	Inter. Dyn. Lab..	1
E.E. 5	Inter. Dyn. Lab..	1	E.E. 9	Dyn. Testing D.C.	1
Math. 6	Adv. Calculus...	3	Math. 21	Anal. Mechanics.	3
Phys. 10	Adv. Elec. Lab..	1	Phys. 11	Electrical Lab...	1
P.E. 5	Physical Ed. ...	—	Geol. 4 / Geol. 6 / Psych. 5	Gen. Geol. ...2 & Field Trips.1 or Psychology	3
			P.E. 6	Physical Ed. ...	—
		18			18

SUMMER: E.E. 24, Industrial employment for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
E.E. 10	Dyn. Testing A.C.	1	Bus. 18	Accounting	3
E.E. 11	Adv. Dyn. Lab.	3	E.E. 16	Elec. Seminar	2
E.E. 15	Elec. Seminar	1	E.E. 19	Adv. Dyn. Lab.	2
E.E. 112	A.C. Machinery	3	E.E. 118	Elec. Power Trans.	3
E.E. 114	Elec. Stations	2	M.E. 25	Engineering Lab.	1
M.E. 21	Engineering Lab.	1	Any two of the following:		
E.E. 21	Elec. Com.	3	E.E. 20	Elec. Traction	6
E.E. 23	or Thesis		E.E. 23	Thesis	
E.E. 113	or Elec. Design		E.E. 26	Elec. Com.	
Bus. 25	Corp. Finance	3	E.E. 122	Elec. Transients	
Engl. 4 or 129.	or English§		Engl. 5 or 130.	English§	
Hist. 13	or History		Math.†		—
Math.†		—	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		17			17

* Taken by students who elect Chap. 1 and 2 during freshman year.

§ If elected, to be taken for one semester only.

† Students who have completed Math. 21 with high standing may elect Math. 111, 112, 122, 123, or 124 on approval of the Director of the Curriculum.

THE CURRICULUM IN ENGINEERING PHYSICS

The recognition of the economic value of scientific investigation and the realization that growth and expansion follow upon research have led to the establishment of research laboratories in every field of industry and have resulted in a demand for trained personnel which at present far exceeds the supply. Scientific research has assumed an importance as a basis of industry equal to the exploitation of natural resources and must in the future become increasingly important as natural resources diminish. The amazing expansion in the electrical industries is to a very large extent the result of research. The statement applies more or less to every major industry, among the products of which we may list the incandescent lamp, the telephone, radio, the automobile, the airplane, talking movies, optical glass, and scientific instruments and equipment.

Keeping pace with the industrial needs of the country, the research laboratories of the government are expanding at a corresponding rate. Such are the laboratories of the Bureau of Standards, the Bureau of Mines, the Naval Research Laboratory, etc. In the educational field the universities have reflected the spirit of the age in the expansion of research facilities and in vastly increased research productivity. In every field of industry, great or small, in government service, and in education there is an insistent demand for men trained in the methods and technic of research, men with a more thorough training in fundamental science than the specialized engineer has time or opportunity to acquire in a course crowded with technical subjects.

These conditions have arisen so recently that students in our schools and colleges are largely unaware that they exist. As a student surveys his opportunities for a life work, engineering signifies to him the spirit of the age. He reads of wonderful achievements in telephony, radio, and television. Brilliant nitrogen-filled lamps and glowing neon tubes excite his wonder. He is curious about the photo-electric cell and the remarkable things it can do. These are achievements of the research laboratory, the work of the physicist. Many students select engineering because of their interest in just these realms.

The work of the physicist requires not only special training but a special aptitude, an inquiring type of mind, and an in-

satiable curiosity. The investigator is an explorer and not all men are born explorers. There are plenty of students, however, who could qualify for a research career who do not know that opportunities in this field exist. Three avenues are open to the trained physicist: (1) he may enter an industrial research laboratory; (2) he may enter one of the great government laboratories; (3) he may become a university teacher and investigator. As to ultimate attainment it is the common experience of research men to advance to positions of high executive and administrative responsibility. The research laboratory is a direct route to such advance. The thorough training in fundamentals, coupled with the specialized knowledge obtained through research, is the best qualification for administrative work in connection with the products of research. In every field the opportunities of the physicist are almost boundless and his attainments limited only by his ability.

The curriculum in Engineering Physics is designed to train young men so that upon graduation they may be fitted to enter an industrial or government laboratory and be able to attack problems in research or in engineering development for which these laboratories are designed. Courses in physics are continued through the entire four years and courses in mathematics through three years. The specialization (forty-two hours of physics out of one hundred and forty-eight hours of required work) is not extreme nor is it at the expense of a broad general education. Courses in civil, mechanical, and electrical engineering subjects included in the upper two years give to the work the necessary engineering slant. The inclusion of subjects which have a broadening and humanizing value is intended to provide the student with a more liberal education than he would obtain were he to devote his time to the study of science and engineering alone. Thus courses in economics and elective courses in history, psychology, business administration, biology, and geology are included. To enable the student to have a fair ability to read scientific literature in French or German, courses in these modern languages are required.

The physics of the freshman year is a survey course intended to give a perspective of the entire subject. Intensive

study of the science begins with the sophomore year, in the first semester of which electricity, magnetism, and sound are studied both in class and laboratory and during the second semester properties of matter, heat, and light. The physics work to this point is common to all engineering curricula.

During the two upper years a more detailed study of special topics is undertaken. An advanced course in Electricity and Magnetism runs throughout the junior year. This is accompanied in the first semester by a course in Optics and Spectroscopy and in the second semester by a course in Heat including kinetic theory and high temperature measurements. In the senior year a course in Modern Theories puts the student in touch with the recent remarkable advances in physics. Parallel with this are courses in Electron Physics and Electric Waves and Oscillations. In the senior year the laboratory work is largely of research type, the student's progress depending very much on his own initiative.

Industrial employment, preferably in a research laboratory, for a minimum of eight weeks is required in one of the summer periods. A written report of this work is called for.

The non-physics courses are divided into technical and non-technical groups, in each of which there are alternative selections. This plan together with a liberal amount of free electives, six hours in the junior and eighteen hours in the senior year, permits the student, if he so desires, to follow a minor group such as geology, biology, or chemistry. There is an increasing demand for men with training in two or more sciences who can undertake problems in the border regions where the sciences overlap. Geophysical methods of ore and oil prospecting, for example, require such combined training in geology and physics. The border region between physics and biology offers similar interesting opportunities.

The curriculum is planned with the idea that most of those taking the course will go directly into an industrial or government laboratory. Those who may decide to go into college teaching are advised to continue after graduation with graduate study. Fellowships and teaching assistantships are usually available at various institutions where work for an advanced degree may be carried on.

The graduates of this curriculum receive the degree of Bachelor of Science in Engineering Physics.

THE CURRICULUM IN ENGINEERING PHYSICS

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Ger. 1 or 5	German	3	Ger. 2 or 6	German	3
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 6	Elec., Mag. & Sound	3	Phys. 4	Mech., Heat & Light	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Geol. 1a	or Geology		Geol. 4	or Geology 2	
Mil. 3	M. S. & T.	2	Geol. 6	& Field Trips 1	
E.C. 3	Eng. Conferences	—	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	E.C. 4	Eng. Conferences	—
*Chap. 3	Chapel	—	P.E. 4	Physical Ed.	—
			*Chap. 4	Chapel	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics	3
Phys. 10	Electrical Lab.	1	Phys. 11	Electrical Lab.	1
Phys. 122	Light	3	Phys. 126	Heat	3
Phys. 162	Th. Elec. & Mag.	3	Phys. 163	Th. Elec. & Mag.	3
E.E. 50	Dyn. & Motors 2	3	E.E. 52	Alt. Currents 2	3
E.E. 51	& Dyn. Lab. 1		E.E. 53	& Dyn. Lab. 1	
M.E. 22	or Heat Eng.		M.E. 23	or Heat Eng.	
Ger. 3	German	3	Ger. 4	German	3
Fr. 1	or French		Fr. 2	or French	
	Elective	3		Elective	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
		19			19

SUMMER: Phys. 50, Industrial employment for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Phys. 120	Electric Waves	3	Phys. 124	El. Dis. in Gases	3
Phys. 160	Mod. Theories	3	Phys. 161	Mod. Theories	3
Phys. 164	Advanced Lab.	2	Phys. 165	Advanced Lab.	2
C.E. 9	Mech. of Mat.	3	E.E. 122	Elec. Transients	3
Geol. 111	or Field Geol. 2		Geol. 110	or Str. Geol. 2	
Geol. 114	& Str. Geol. 1		Geol. 115	& Geol. Meth. 1	
Chem. 190	or Phys. Chem.		Chem. 191	or Ph. Chem. 2	
Math. 111	or Ad. Dif. Eq.		Chem. 195	& Lab. 1	
Met. 21	or Eng. Met. 2		Math. 112	or Ad. Dif. Eq.	
Met. 81	& Met. Prob. 1		Math. 124	or Theo. of Er.	
Math.†		—	Met. 21	or Eng. Met. 2	
	Electives	6	Met. 81	& Met. Prob. 1	
P.E. 7	Physical Ed.	—	Math.†		—
				Electives	6
			P.E. 8	Physical Ed.	—
		17			17

* Taken by students who elect Chap. 1 and 2 during freshman year.
† Students who have completed Math. 21 with high standing may elect Math. 122, 123, or 124 on approval of the Director of the Curriculum.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

Industrial engineering has to do with the organization, operation, and management of manufacturing plants, public utilities, and operating, holding, and management companies. Broadly considered it covers the engineering aspects of plant location, plant layout, routing, production control, maintenance, stores, and inspection; the economic aspects of employment, employee training, promotion, wage payment, bonus, safety and welfare, insurance, and old age pensions; and the commercial aspects of purchasing, marketing, credit, accounting, and finance.

Industrial enterprises depend on sound financing, adequate accounting, and intelligent forecasting of economic developments. Technical skill and engineering efficiency are primary requisites, but these alone are not sufficient. There is a demand by industry for men who have not only a thorough training in the fundamentals of engineering, but also a knowledge of the problems of accounting, finance, statistics, and management which every enterprise encounters. To add to the technical knowledge, fine mental discipline, and scientific spirit that come from engineering study, a knowledge of the basic facts of economics, finance, and management is the objective of the curriculum in Industrial Engineering.

Long known for its high standards in engineering education, Lehigh University has devised the curriculum in Industrial Engineering with the maintenance of these standards as the first consideration. This curriculum is based upon the principle that such a curriculum must be primarily an engineering curriculum, with sufficient work in engineering to make the graduate at home in a highly technical environment. Approximately two-thirds of the four years' work is selected from the basic and essential courses in mechanical, civil, and electrical engineering. The remaining third is selected from the major courses in economics and business administration, so chosen as to provide a thorough training in the fundamental principles of economics, industrial management, corporation financing, and business practice. It is hoped that the curriculum will meet the needs of that considerable body of students who intend to

enter industries essentially technical, whether public utilities or manufacturing plants, but who intend to go into the administrative departments.

The work of the first year is identical with that of all other engineering curricula in the University and includes mathematics, chemistry, physics, English, drawing, and military science. Students in this curriculum take the summer course in Land and Topographic Surveying at the end of the freshman year.

During the sophomore year, students in this curriculum continue with mathematics and physics; they also begin the engineering work with elementary machine design and the business work with economics. Those who elect the advanced course in Military Science and Tactics attend the Reserve Officers' Training Corps Camp during the summer following the sophomore year.

During the junior year the work is evenly divided between engineering and business, three courses in each field of study being carried throughout the year. At the end of the junior year students work a minimum of eight weeks in an industrial plant and turn in a report, typewritten and bound.

In the senior year the work consists of two engineering courses, three business courses and a free elective which may be in either engineering or business, as the student may elect.

In the senior year a maximum of three half-day inspection trips per semester are required of all candidates for a degree. These trips are made to the industries in the vicinity of the University, for the purpose of studying the application of the principles of scientific management. They are scheduled by the professor teaching the course in Industrial Management as a part of the work of that course. Reports are required. When these trips interfere with other rostered work, excuses for absences will be provided as on inspection trips.

Graduates of this curriculum receive the degree of Bachelor of Science in Industrial Engineering.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

First Semester Number	Title	Cr.Hrs.	Second Semester Number	Title	Cr.Hrs.
Bus. 3	Economics	3	Bus. 4	Economics	3
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
Phys. 6	Elec., Mag. & Sound	3	Phys. 4	Mech., Heat & Light	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Engl. / Govt. 51	English or Foreign Language or Amer. Govt.	3	Engl. / Govt. 52	English or Foreign Language or Amer. Govt.	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*Chap. 3	Chapel	—	*Chap. 4	Chapel	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

First Semester Number	Title	Cr.Hrs.	Second Semester Number	Title	Cr.Hrs.
Bus. 11	Accounting	3	Bus. 12	Accounting	3
Bus. 21	Corp. Finance	3	Bus. 22	Corp. Finance	3
Bus. 29	Money & Banking	3	Bus. 30	Money & Banking	3
C.E. 9	Mech. of Materials	3	C.E. 13	Hydraulics	2
M.E. 22	Heat Engines	3	C.E. 14	Hydraulics Lab.	1
M.E. 30	Mechanism	3	E.E. 50	Dyn. & Motors	2
P.E. 5	Physical Ed.	—	E.E. 51	Dynamo Lab.	1
			M.E. 23	Heat Engines	3
			P.E. 6	Physical Ed.	—
		18			18

SUMMER: M.E. 27, Work in industrial plant for eight weeks, with report.

SENIOR YEAR

First Semester Number	Title	Cr.Hrs.	Second Semester Number	Title	Cr.Hrs.
Bus. 33	Labor	3	Bus. 40	Ind. Management	3
Bus. 39	Ind. Management	3	Bus. 56	Business Law	3
Bus. 45	Statistics	3	Bus. 126	Pub. Finance	3
E.E. 52	Alt. Currents	2	E.E. 54	Electrical Eng.	2
E.E. 53	Dynamo Lab.	1	E.E. 55	Dynamo Lab.	1
M.E. 10	Thermodynamics.	3	Met. 21	Metallurgy	2
	Elective	3	Met. 81	Met. Problems	1
P.E. 7	Physical Ed.	—		Elective	3
			P.E. 8	Physical Ed.	—
		18			18

* Taken by students who elect Chap. 1 and 2 during freshman year.

THE CURRICULUM IN MECHANICAL ENGINEERING

Mechanical engineering has to do with the conversion of the energy latent in coal into heat for warming our houses and cooking our food; into mechanical energy for operating our factories and propelling our trains, automobiles, steamships, and aeroplanes; into electrical energy for turning our motors and lighting our houses. Likewise it has to do with the design, construction, installation, and operation of the machinery necessary for the economical and advantageous uses of power and with the management of the industries and organizations manufacturing and using power-driven equipment.

The young graduate ordinarily goes into a graduate apprenticeship in some public utility, manufacturing, or selling organization, from which he may work up to a position as power engineer, works manager, or sales engineer.

The curriculum in Mechanical Engineering is arranged to afford a comprehensive, rigorous training in the analysis of those fundamental scientific principles which form the basis of the design of apparatus and machinery, the equipment and operation of industrial plants, and the production and utilization of power.

The work of the freshman year is identical with that of the other engineering curricula at the University. Immediately following the freshman year, students electing mechanical engineering take the course in Land and Topographic Surveying at the surveying camp, which is conducted as part of the Summer Session.

During the sophomore year a choice between English and foreign language is offered, freshman drawing gives way to elementary machine design, and freshman chemistry is replaced by an elementary course in Heat Engines. Otherwise the work is strictly a continuation of the courses taken in the freshman year. At the end of the sophomore year, students electing the advanced work in Military Science and Tactics attend the Reserve Officers' Training Corps Camp for a period of six weeks.

In the junior year the work in mathematics is completed, the study of heat is continued as Thermodynamics and Heat

Engines, both supplemented by laboratory courses, and design is continued as Mechanism. The study of Metallurgy and Mechanics of Materials is completed during the first semester. Work in the College of Business Administration begins in the first semester and continues throughout the junior and senior years. Work in electrical engineering is inaugurated in the second semester and continues throughout the senior year. At the close of the junior year, students work for eight weeks during the summer, in industrial plants, on student apprenticeship work, or on engineering construction as approved by the department. A report, typewritten and bound, is required.

During the senior year the work is broadly distributed. In addition to the major mechanical engineering courses, work is prescribed in the departments of Civil and Electrical Engineering, and in the College of Business Administration. During the second semester students normally take English, although provision is made for Thesis or elective as approved by the department.

Students taking any of the courses in Engineering Laboratory are subject to call for duty on a maximum of one twenty-four hour test per semester. When such duty interferes with scheduled exercises, excuses for absences will be provided as on inspection trips.

In the senior year one trip is taken to New York or Philadelphia, during which visits of inspection are made to power plants, municipal works, ship yards, and a variety of industrial plants located in these cities or the vicinity. This trip is required of all students who are candidates for a degree. The minimum expense is about $25.00.

Graduates of this curriculum receive the degree of Bachelor of Science in Mechanical Engineering.

THE CURRICULUM IN MECHANICAL ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
M.E. 2	Elem. Heat. Eng.	3	M.E. 5	Elem. Heat. Eng.	3
Phys. 6	Elec., Mag. & Sound	3	Phys. 4	Mech., Heat & Light	3
Phys. 7	Physics Lab.	1	Phys. 5	Physics Lab.	1
Engl.	English or Foreign Language	3	Engl.	English or Foreign Language	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
*Chap. 3	Chapel	—	*Chap. 4	Chapel	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3
C.E. 9	Mech. of Materials	3	E.E. 50	Dyn. & Motors	2
C.E. 10	Mat. Testing Lab.	1	E.E. 51	Dynamo Lab.	1
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics.	3
M.E. 9	Engineering Lab.	1	M.E. 6	Mechanism	4
M.E. 10	Thermodynamics.	3	M.E. 11	Engineering Lab.	1
Met. 21	Metallurgy	2	M.E. 108	Heat Engines	3
Met. 33	Metallurgy Lab.	1	Met. 34	Metallurgy Lab.	1
Met. 81	Met. Problems	1	P.E. 6	Physical Ed.	—
P.E. 5	Physical Ed.	—			
		18			18

SUMMER: M.E. 27, Work in industrial plant for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
C.E. 13	Hydraulics	2	E.E. 54	Electrical Eng.	2
C.E. 14	Hydraulics Lab.	1	E.E. 55	Dynamo Lab.	1
E.E. 52	Alt. Currents.	2	M.E. 116	Adv. Design.	4
E.E. 53	Dynamo Lab.	1	M.E. 117	Adv. Mech. Eng.	3
M.E. 112	Adv. Design.	4	M.E. 118	Engineering Lab.	2
M.E. 113	Adv. Mech. Eng.	3	Engl. 41 or 42. / M.E. 15	English or Thesis or approved Elective	3
M.E. 114	Engineering Lab.	2	Bus. 18 / Bus. 40 / Bus. 56	Accounting or Ind. Man. or Bus. Law.	3
Bus. 25 / Bus. 39 / Bus. 45	Corp. Finance or Ind. Man. or Statistics.	3	Math.†		—
Math.†		—	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		18			18

* Taken by students who elect Chap. 1 and 2 during freshman year.

† Students who have completed Math. 21 with high standing may elect Math. 111, 112, 122, 123, or 124 on approval of the Director of the Curriculum.

THE CURRICULUM IN METALLURGICAL ENGINEERING

The object of this curriculum is the preparation of the student for practice in the fields of metallurgy. These cover two general types of practice, namely: the production, refining, and preparation for sale of the metals, such as iron, steel, copper, lead, zinc, aluminium, etc., and the intelligent use of metals and alloys in industries, for structures, railroads, automobiles, machinery, vehicles, pipe, tools, hardware, ordnance, wire products, etc. Since metallurgists are employed in almost every great industry, it is recognized that broad training is demanded. Emphasis is therefore laid on the thorough training of the student in fundamentals, and the curriculum is planned to be as general, fundamental, and broad as the requisite amount of metallurgical training will permit. It is a fairly simple matter for a man thoroughly grounded in fundamental theory to make the necessary applications to actual practice when the need arises, but if his knowledge is purely practical the acquisition of theory is a more difficult achievement.

The foundation of a course in metallurgical engineering must be a thorough training in mathematics, chemistry, physics, economics, English, and one or two foreign languages. A large portion of the first two years of the curriculum is devoted to these subjects, while the last two years are given mainly to their application in the various technical subjects and in industry.

Collateral studies in other departments than metallurgy are liberally provided, such as Mechanical Drawing, Surveying, Descriptive Geometry, Mechanics of Materials, and Hydraulics, including laboratory, in the Department of Civil Engineering; Electricity and Magnetism and Electrical Laboratory in the Department of Physics; Alternating Currents, Dynamos and Motors, Electrical Engineering, and Dynamo Laboratory in the Department of Electrical Engineering; Heat Engines, comprising the study of thermodynamics, boilers, steam engines, gas engines, and internal combustion motors, and Engineering Laboratory, in the Department of Mechanical Engineering; Mineralogy, General Geology, and Economic Geology in the De-

partment of Geology; and Ore Dressing in the Department of Mining Engineering.

Instruction is given in English composition and public speaking, and in writing metallurgical reports. German and French are given in the sophomore year. The one year of either German or French is supplemented in the senior year by a course of study in metallurgical literature in German and French with the staff of the Department of Metallurgy.

The studies in chemistry, which are so important to the metallurgist, include laboratory experiments, Qualitative and Quantitative Analysis, both gravimetric and volumetric, of the more common ores and metallurgical products, including Gas Analysis and Assaying, along with courses in Stoichiometry, Advanced Chemistry, and Physical Chemistry. This instruction, together with the courses in Physics and Physics Laboratory, constitutes the foundation on which the metallurgical instruction is based.

The special instruction in Metallurgy includes lectures on the production of metals, followed by a discussion of their economic and industrial importance and their physical and chemical properties, including statistics of their production and details concerning the distribution of their ores and the geographical distribution and conditions of their production. Courses of lectures extending over three years take up in detail the general principles of metallurgy and their applications to specific cases. The first course treats of the general physical and chemical principles utilized in extracting metals from their ores and the manner in which they are applied, and is followed by a course on the Metallurgy of Iron and Steel, and by another course on the metallurgy of the other metals, copper, lead, silver, gold, etc., in which each metal is discussed in detail. A course of lectures is also given on the principles of electrochemistry and their application in electrometallurgy, accompanied by laboratory investigations of these principles. A course in Metallography acquaints the student with the methods of studying the physical properties, constitution, and structure of metals and alloys with the microscope, pyrometer, and other instruments of precision. The seminar in the senior year is intended to bring together the members of the department and the students in the discussion of current metal-

lurgical questions and problems, and especially to give facility in presenting data to others in clear, concise, and forceful English. Metallurgical articles in English and foreign languages are abstracted and presented. The student's presentation is criticised by his fellows and instructors.

In order to impress metallurgical principles upon the student's mind and in order to accomplish the most difficult of all teaching achievements, making the student think, the course includes a series of problems dealing with practical details of the metallurgical processes in an exact and quantitative manner, the data whenever possible being taken from every-day commercial practice, so that the results may give an insight into the quantitative relations that are fundamental to all metallurgical processes.

Information is crystallized in the minds of the students by laboratory exercises in which they are required to study the principles of chemical, physical, and mechanical metallurgy. Instruction is given in connection with this laboratory work with the object of teaching and encouraging the practice and application of research in metallurgy. The course is planned to emphasize the principles and subordinate time-consuming manual operations. The course employs laboratory apparatus and is preliminary to work, during which the students often have to apply the underlying principles they are studying to full-size operations and furnaces in commercial metallurgical work and foundries.

Through the kindness of the officials of the Bethlehem Steel Company, the students spend a total of about fifteen to twenty afternoons of three hours each in the steel works, studying the operations in detail under the guidance of instructors, there being not more than ten students to each instructor. These visits are co-ordinated with a conference period; the students are informed in advance just what subjects are to be studied during each visit, and are required to report thereon in writing or orally. Visits of inspection are also made to other metallurgical works and industrial plants, such as smelters and refiners of copper, lead, gold, silver, and zinc. Plants where heat treating of metals and alloys is practiced in an unusually well-developed manner are also visited. Plants visited in 1928-1929 included the American Smelting & Refining

Company, the Raritan Copper Works, the Carpenter Steel Company, the Lukens Steel Company, the By-Product Coke Plant of the Bethlehem Steel Company, the Plants and Research Laboratory of the New Jersey Zinc Company, and others. The students also spend part of one summer vacation working in a metallurgical plant, but it is believed that employment activity of college students does not give the same facility in applying principles or the same keenness of observation as work under the immediate direction of instructors. In individual cases, however, so-called "industrial co-operative courses" have been arranged for special and graduate students.

Graduates of this curriculum receive the degree of Bachelor of Science in Metallurgical Engineering.

THE CURRICULUM IN METALLURGICAL ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Chem. 33	Quant. Analysis	3
Chem. 44	Quant. Anal. Conf.	1
Geol. 1a	Mineralogy	3
Math. 4	Elem. Calculus	3
Phys. 6	Elec., Mag. & Sound	3
Phys. 7	Physics Lab.	1
Engl. 6	Essay	3
Engl. 10	or Pub. Speak.	
Ger. 1 or 5	or German	
Fr. 1 or 11	or French	
Span. 1 or 11	or Spanish	
Bus. 3	or Economics	
Mil. 3	M. S. & T.	2
E.C. 3	Eng. Conferences	—
P.E. 3	Physical Ed.	—
*Chap. 3	Chapel	—
		19

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Math. 5	Appl. Calculus	3
Met. 1	Gen. Metallurgy	2
Met. 61	Met. Problems	1
Phys. 4	Mech., Heat & Light	3
Phys. 5	Physics Lab.	1
Chem. 35	Quant. Anal. 3	4
Chem. 46	& Quant. Conf. 1	
Geol. 4	or Gen. Geol. 2	
Geol. 6	& Geol. Trips 1	
Geol. 5	& Petrology 1	
Ger. 2 or 6	German	3
Fr. 2 or 12	or French	
Span. 2 or 12	or Spanish	
Bus. 4	or Economics	
Bus. 18	or Accounting	
Mil. 4	M. S. & T.	2
E.C. 4	Eng. Conferences	—
P.E. 4	Physical Ed.	—
*Chap. 4	Chapel	—
		19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas, and Oil Analysis, four weeks, 4; or Met. 48, industrial employment for eight weeks, with report; or Mil. 9 or 19, Reserve Officers' Training Corps Camp for those who elect Advanced Military Science and Tactics.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
C.E. 9	Mech. of Materials	3	C.E. 13	Hydraulics	2
C.E. 10	Mat. Testing Lab.	1	C.E. 14	Hydraulics Lab.	1
M.E. 22	Heat Engines	3	E.E. 50	Dyn. & Motors	2
Met. 2	Met. of I. & S.	2	E.E. 51	Dynamo Lab.	1
Met. 5	Electrochemistry	1	M.E. 23	Heat Engines	3
Met. 35	Elec. Chem. Lab.	1	Met. 106	Electrometallurgy	1
Met. 62	I. & S. Problems	1	Met. 30	Physical Met. }	2
Any two of the following:†			Biol. 51	or San. Bact. }	
Mine. 3	Ore. Dr., Coal Prep. & Lab. }	6	Any two of the following:†		
Chem. 6	Adv. Chemistry }		Geol. 108	Econ Geology }	6
Bus. 3	Economics }		Chem. 7	Adv. Chemistry }	
P.E. 5	Physical Ed.	—	Bus. 4	Economics }	
			Bus. 18	Accounting }	
			P.E. 6	Physical Ed.	—
		18			18

SUMMER: Met. 49, Industrial employment for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Chem. 98	Physical Chem.	2	E.E. 54	Electrical Eng.	2
E.E. 52	Alt. Currents	2	E.E. 55	Dynamo Lab.	1
E.E. 53	Dynamo Lab.	1	Met. 4	Met. of Zinc, Aluminium, etc.	2
M.E. 19	Engineering Lab.	1	Met. 132	Metallurgy Lab.	3
Met. 3	Met. of Copper, Lead, Gold & Silver	2	Met. 140	Seminar	2
Met. 131	Metallography	2	Met. 164	Met. Problems	1
Met. 139	Seminar	3	Any two of the following:		
Met. 163	Met. Problems	1	Chem. 7	Adv. Chemistry }	6
Psych. 5	Psychology }	3	Geol. 108	Econ. Geology }	
Bus. 25	or Corp. Fin. }		Bus. 56	Business Law }	
Chem. 6	or Adv. Chem. }		Phys. 161	Modern Phys. }	
Phys. 160	or Mod. Phys. }		P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		17			17

* Taken by students who elect Chap. 1 and 2 during freshman year.
† At least one of the three business administration courses listed in the junior year must be chosen.

THE CURRICULUM IN MINING ENGINEERING

Mining engineering has to do with the extraction of raw materials of economic value from the earth and their preparation for the needs of modern civilization. The mining engineer therefore operates coal deposits, mines which produce ores of the common and precious metals, quarries, oil and gas wells, etc. In so doing he makes use of the technical and business principles which he has acquired by study in every curriculum of the University. In view of the breadth of training and fields of possible activity, few professions offer more varied, interesting, and profitable experiences than that of mining engineering.

The present curriculum offers several options in the junior and senior years. The student may specialize in construction materials, structural steel design, or electrometallurgy; he may elect advanced geology, fuel technology, metallurgy, engineering laboratory, or mine administration; or he may choose one of several business subjects or Spanish.

During the Freshman year a foundation is laid in the fundamental subjects of mathematics, physics, chemistry, drawing, and English. Lectures are given in physiology and hygiene, and in military science and tactics. Military drill and systematic physical exercise are required.

Land, Topographic, and Railroad Surveying is given in the summer session at the close of the freshman year; Mine Surveying, given in the junior year, includes actual surveying in the coal mines and inspection trips to mines and coal breakers.

The course in chemistry begins with an introduction to general chemical theory and the elements, supplemented by laboratory work. This is followed by Qualitative and Quantitative Analysis. Chemical problems and reactions are taught in Stoichiometry. Assaying, Coal, Gas, and Oil Analysis is given in the summer session. The instruction includes the analysis of common ores, fuels, gases, and metallurgical products.

Mineralogy is introduced by a short course in crystallography, in which models of crystals and mineral specimens are studied.

In the courses in geology, the student studies the nature and structure of the rock masses of the earth's crust and the forces which modify them. A brief review of historical geology gives an insight to the formation of the earth and the development of life as recorded by fossil remains. Practice in Field Geology teaches the methods by which rock formations are accurately mapped. Economic Geology treats of the origin, mode of occurrence, and distribution of the metallic and non-metallic minerals and substances of commercial value in the earth. The course in Petrography teaches the student to identify the common rock-forming minerals by the use of the microscope. The course in Stratigraphic Geology discusses the geologic ages and the geographic distribution of the rocks of the continent and their history.

The course in Heat Engines includes a study of boilers, steam and gas engines, and steam turbines. Boiler and engine tests are given in the course in Engineering Laboratory. Mechanics of Materials teaches the theory of beams, columns, shafts, and the methods of designing them for use in structures. Graphical analysis of the forces applied in the above is taught in the course in Graphic Statics. Hydraulics deals with the flow of liquids through orifices, pipes, and channels, and with the principles of hydraulic motors. Practical tests in the Fritz Engineering Laboratory constitute an important part of the work in these courses.

The instruction in Mining Engineering and Mining Methods is given during the junior year, under the following subdivisions: prospecting, boring, mining or exploitation, haulage, hoisting, drainage, ventilation, lighting, first-aid, and railroads. These subjects treat successively of the steps by which minerals are discovered and valued, the manner in which they are extracted from the earth and brought to the surface, the manner in which accidents may occur, means for guarding against them, the treatment of injured persons, and the means by which mines are maintained in an economical condition from the viewpoint of mine owner and miner.

The subjects of Ore Dressing and Coal Preparation, supplemented by work in the Coxe Mining Laboratory, deal with the processes by which ores and fuels are rendered marketable.

Fuel Technology deals with the theoretical aspects and practices in the utilization of coal, oil and gas in the industries.

Construction treats of materials used in roads and structures in and around mines, particular attention being given to the use of reinforced concrete. In Structural Steel Design a study is made of the stresses acting on steel structures, special emphasis being given to the design of types common to mining plants. Mine Administration discusses the method of employing labor, mining principles, and management.

The course in Oil Field Practice includes a study of the occurrence and distribution of petroleum and natural gas, the methods of prospecting, the means for obtaining them from the earth, and their storage, transportation, refining, and marketing.

In Metallurgy the general principles of the subject, embracing fuel, furnaces, and processes, are presented, followed by the metallurgy of iron and steel, copper, lead, gold, silver, zinc, tin, mercury, nickel, and aluminium. Electrochemistry and Electrometallurgy familiarize the student with the practical applications of electricity to metallurgical processes including electric furnace practice. Visits of inspection are made to metallurgical plants in the vicinity, and also to those near New York City.

Dynamos and Motors and Alternating Currents extend over the entire senior year and embrace the study of the industrial applications of electricity which are of particular value to the mining engineer; practical work in the Dynamo Laboratory is included in these courses.

The courses in Business Administration in the junior and senior years present the economic, industrial, administrative, and legal aspects of conditions in the business world which are of particular importance to the engineering professions.

The option in Spanish is offered during the senior year for those who purpose going to Latin-American countries.

Sanitary Bacteriology has to do with the study of bacteria, and their particular importance in connection with public water supplies, water analysis, sewage disposal, etc.

From the foregoing description of the general content of the curriculum, it will be noted that the student in Mining Engineering has studies in all of the technical departments of the University, as well as in the Colleges of Arts and Science and Business Administration.

The facilities for supplementing the work of the curriculum by inspection trips are exceptionally good. Cement mills, ore and coal mines, limestone, slate, and cement quarries are within easy distance, and in the city are the great works of the Bethlehem Steel Company. During the senior year all students are required to make inspection trips to the anthracite coal regions and to the metal mining districts of eastern Pennsylvania and of New Jersey.

Voluntary inspection trips to the mines of the northeastern and central part of the United States and southern Canada, which included the Lake Superior iron and copper region and the nickel, gold, and silver districts of Ontario, were made in the summers of 1922, 1924, and 1926. These trips proved so successful that it is expected a similar one will be offered every other year, provided a sufficient number of students apply. By traveling in automobiles and camping en route, it is possible to keep the expenses very low. The cost of this trip, lasting five weeks, is approximately $175.00.

The expenses of the required inspection trips required of all mining students are approximately as follows:

Three Metallurgical one-day trips	$18.00
Mine Surveying and Inspection trip, one week	$30.00
Mining and Geological Inspection trips, four days	$25.00

The Department of Mining Engineering has exceptional facilities in the Eckley B. Coxe Mining Laboratory, a description of which is given under the heading of Buildings.

Graduates of this curriculum receive the degree of Bachelor of Science in Mining Engineering.

THE CURRICULUM IN MINING ENGINEERING

FRESHMAN YEAR

See page 60

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 36	Quant. Analysis	2	Chem. 37	Quant. Analysis	2
Chem. 48	Quant. Anal. Conf.	1	Chem. 49	Quant. Anal. Conf.	1
Geol. 1	Mineralogy	4	Geol. 4	Geology	2
Math. 4	Elem. Calculus	3	Geol. 5	Petrology	1
M.E. 22	Heat Engines	3	Geol. 6	Geology Trips	1
Phys. 6	Elec., Mag. & Sound	3	Math. 5	Appl. Calculus	3
Phys. 7	Physics Lab.	1	M.E. 23	Heat Engines	3
Mil. 3	M. S. & T.	2	Phys. 4	Mech., Heat & Light	3
E.C. 3	Eng. Conferences	—	Phys. 5	Physics Lab.	1
P.E. 3	Physical Ed.	—	Mil. 4	M. S. & T.	2
*Chap. 3	Chapel	—	E.C. 4	Eng. Conferences	—
			P.E. 4	Physical Ed.	—
			*Chap. 4	Chapel	—
		19			19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas, and Oil Analysis, four weeks, 4.

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Bus. 3	Economics	3	C.E. 13	Hydraulics	2
C.E. 9	Mech. of Materials	3	C.E. 14	Hydraulics Lab.	1
C.E. 10	Mat. Testing Lab.	1	Engl. 41 or 42	Adv. Composition	3
Geol. 112	Petrography	2	Met. 21	Metallurgy	2
Mine. 1	Mining Eng.	3	Met. 81	Met. Problems	1
Mine. 2	Mining Methods.	3	Mine. 5	Mining Eng.	3
Mine. 3	Ore Dress., Coal Prep. & Lab.	3	Mine. 6	Mine Surveying	3
P.E. 5	Physical Ed.	—	Bus. 18	Accounting	6
			Bus. 4	or Economics.	
			P.E. 6	Physical Ed.	—
		18			18

SUMMER: Mine. 20, Industrial employm nt for eight weeks, with report; or Mil. 9 or 19, Reserve Officers' Training Corps Camp for those who elect Advanced Military Science and Tactics, 3.

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
C.E. 20	Graphic Statics	2	E.E. 52	Alt. Currents	2
E.E. 50	Dyn. & Motors	2	E.E. 53	Dynamo Lab.	1
E.E. 51	Dynamo Lab.	1	Geol. 108	Econ. Geol.	3
Geol. 7	Economic Geol.	2	Mine. 8	Oil Field Prac.	2
Mine. 7	Construction	2	Geol. 110	Stratig. Geol.	2
Met. 25	or Electrochm.		Met. 4	or Non-ferrous Metal.	
Geol. 111	Field Geology	2	Mine. 11	or Fuel Tech.	
Met. 3	or Non-ferrous Metal.		C.E. 30	Str. Steel Des.	3
Biol. 51	Sanitary Bac.	2	C.E. 125	or Reinf. Con.	
Mine. 10	or Fuel Tech.		M.E. 25	Engine Lab.	1
Geol. 115	Geol. Method	1	Geol. 115	or Geol. Method	
M.E. 21	or Engine Lab.		Mine. 9	or Mine Adm.	
Span. 1 or 11	Spanish	3	C.E. 126	or Cem. Lab.	
Bus. 39	or Ind. Man.		Span. 2 or 12	Spanish	3
Bus. 25	or Corp. Fin.		Bus. 18	or Accounting	
P.E. 7	Physical Ed.	—	Bus. 56	or Bus. Law.	
			Bus. 40	or Ind. Man.	
			P.E. 8	Physical Ed.	—
		17			17

* Taken by students who elect Chap. 1 and 2 during freshman year.

DESCRIPTION OF COURSES

Following is a list of the undergraduate and graduate courses offered by Lehigh University. The number of exercises a week in each subject is indicated by the figures in parenthesis. Three hours of drawing, of work in the laboratory, or of practice in the field are regarded as equivalent to a recitation or lecture of one hour's duration.

ASTRONOMY

See Mathematics and Astronomy

BIOLOGY

PROFESSORS HALL AND THOMAS, MESSRS. FARRELL AND TREMBLEY

Biol. 1. Biology. Lectures, written recitations, laboratory work. The lectures deal with the following topics: (*a*) fundamental conceptions: life, protoplasm, the cell, etc.; (*b*) the more important biological theories: variation, heredity, evolution, etc. In the laboratory, types of the various phyla are dissected and drawings made. Fee, $3.00. First semester (3).

Biol. 2. Mammalian Anatomy. Two laboratory periods, the work consisting of the detailed dissection of a mammal. Prerequisite: Biol. 1. Fee, $5.00. Second semester (2).

Biol. 3. Comparative Anatomy of Vertebrates. Text-book work and recitations on the comparative anatomy of vertebrates; laboratory work consisting of the dissection of types of the several vertebrate classes. Prerequisite: Biol. 1. Fee, $3.00. Second semester (3).

Biol. 4. Vertebrate Embryology. Lectures, text-book, and laboratory work. Study of living, preserved, and sectioned material demonstrating the successive stages of cleavage, gastrulation, and the formation of organs. Prerequisite: Biol. 1 and, preferably, Biol. 3. First semester (3).

Biol. 5. Physiology. A course in normal physiology, hygiene, and sanitation aiming to give that knowledge of the body and its functions which all should have. Emphasis on the application of such knowledge to personal hygiene and public sanitation. First semester (2).

Biol. 6. Botany. A survey of the subject designed to give the student a general knowledge of plant life, morphology, physiology, and the classification of the vegetable kingdom. Type species studied in the laboratory and field trips to familiarize the student with plant habitats. Second semester (3).

Biol. 7. Elementary Biology. A course dealing with the characteristics and the history of living organisms. Biol. 7 and Biol. 8 form a continuous course and should not be taken separately. First semester (3).

Biol. 8. Elementary Biology. Continuation of Biol. 7. Second semester (3).

Biol. 9. Genetics. The laws and the mechanism of heredity; eugenics. Prerequisite: Biol. 1. Second semester (1).

Biol. 15. Freshman Hygiene. A course of six lectures on personal and social hygiene, with the cooperation of the Director of the Students' Health Service. This course is given during Freshman Week and must be passed by all freshmen.

Biol. 16. Social Hygiene. A course for students who for any reason have not taken or have not passed Biol. 15. Second semester.

Biol. 50. Sanitary Bacteriology. Study of bacteria and allied microörganisms by staining and cultural methods; their sanitary importance in public water supplies; the bacteriology of sewage and sewage treatment; qualitative and quantitative bacteriological and biological analysis of water and sewage. Lectures, recitations, and laboratory work. Fee, $3.00. Second semester (3).

Biol. 51. Sanitary Bacteriology. Similar to Biol. 50. Fee, $3.00. First or second semester (2).

Biol. 52. Bacteriology. An elementary course in general bacteriology. A general study of the morphological and cultural characteristics of bacteria and allied microörganisms; special attention given to those forms of sanitary and economic importance; the role of bacteria, yeasts, and molds in fermentation industries, in the soil, and in disease. Lectures, recitations, and laboratory work. Fee, $3.00. First semester (3).

Biol. 54 Bacteriology. A course in elementary bacteriology for pre-medical students and others specializing in biological sciences. Laboratory work including special staining methods in the study of morphology; differential media in the study of bacterial physiology; and in general a more thorough study of the microörganisms themselves rather than their specific sanitary or industrial importance. Recitations, lectures, and laboratory work. Fee, $3.00. First semester (3).

For Advanced Undergraduates and Graduates

Biol. 112. Histology and Microscopical Technique. Second semester (2).

Biol. 153. Advanced Bacteriology. A laboratory and seminar course in advanced laboratory technique; a thorough cultural study of the more common pathogenic bacteria; bacteriological laboratory diagnosis of pathological fluids. Prerequisites: Biol. 51, 52, or 54. Fee, $3.00. Second semester (3).

Biol. 158. Immunology. A comprehensive recitation course in the history of the study of immunity and modern theories concerning its mechanism. Prerequisite: Biol. 50 (or 52 or 54). Biol. 153 desirable either previously or concurrently. Second semester (3).

For Graduates

Prerequisite for graduate work in Biology: the amount of biology usually obtained by an undergraduate majoring in that department. Prerequisite for graduate work in Bacteriology: a satisfactory course in undergraduate bacteriology and a sufficient preparation in organic chemistry.

Biol. 203. Vertebrate Histogenesis and Organogenesis. Careful following, in the laboratory, of the development of a vertebrate; tracing of the history of the germ-layers, organs, and tissues; organogenesis dealing with the association of tissues to form organs. First semester (3). Professor Hall.

Biol. 205. History of Biology. A course based on reading, seminars, and written reports. First or second semester (2). Professor Hall.

Biol. 206. Biological Theories. A course dealing especially with genetics. First or second semester (2). Professor Hall.

Biol. 207. Biological Research. In this course a student may pursue investigations in such subjects as embryology, comparative anatomy, genetics, etc., according to his preparation and interests. First semester (3). Professor Hall.

Biol. 208. Biological Research. Continuation of Biol. 207. Second semester (3). Professor Hall.

Biol. 251. Bacteriological Research. In this course competent graduate students are given laboratory problems to be worked out under the supervision of the Professor of Bacteriology. Prerequisites: Biol. 50 (or 52 or 54) and 153 and at least one semester of organic chemistry. First semester (3). Professor Thomas.

Biol. 252. Bacteriological Research. Continuation of Biol. 251. Second semester (3). Professor Thomas.

Biol. 253. Bacteriological Research. May be taken simultaneously with Biol. 251 by graduate students majoring in Bacteriology. First semester (2). Professor Thomas.

Biol. 254. Bacteriological Research. May be taken simultaneously with Biol. 252 by graduate students majoring in Bacteriology. Biol. 253 and 254 are given only to graduate students who are majoring in Bacteriology. Biol. 251 and its continuation, Biol. 252, may be taken by graduate students minoring in Bacteriology. Second semester (2). Professor Thomas.

Biol. 255. Industrial Bacteriology. An advanced course in bacteriology including aspects of industrial chemistry in which bacteria play an essential part in the process, as in the manufacture of acetone, butyl alcohol, acetic and lactic acids, etc. A study of the common contaminating organisms which cause commercial losses in the manufacture of sugar, leather, etc. Prerequisite: Biol. 52 or 54. First semester (3). Professor Thomas.

Biol. 257. Advanced Public Sanitation. A study of the biological, chemical, bacteriological, and physical aspects of public

water supplies. Prerequisites: Biol. 51, 52, or 54 and at least two years of chemistry, including quantitative analysis. First or second semester (1). Professor Thomas.

Biol. 258. Advanced Public Sanitation. Similar to Biol. 257, dealing with systems of sewage disposal. Prerequisites: same as for Biol. 257. First or second semester (1). Professor Thomas.

Biol. 259. Advanced Public Sanitation. Similar to Biol. 257, dealing with milk distribution. Prerequisites: same as for Biol. 257. First or second semester (1). Professor Thomas.

Biol. 260. Serology. A laboratory course in the preparation of antigens, immunization of animals, and the study of immune products such as agglutinins. precipitins, bacteriotropins, lysins, etc. To be taken by graduate students simultaneously with or following Biol. 158. Prerequisites: same as for Biol. 158. First or second semester (3). Professor Thomas.

BUSINESS ADMINISTRATION

PROFESSORS CAROTHERS, COWIN, AND DIAMOND, ASSOCIATE PROFESSOR BRADFORD, ASSISTANT PROFESSORS BISHOP, BRATT, AND HARING, MESSRS. BUCK AND MEAD

Bus. 1. Industrial Evolution. An introductory course outlining the gradual development of economic organization, with special attention to the stages of economic progress and social institutions growing out of these stages. First semester (3).

Bus. 2. Industrial Evolution. Continuation of Bus. 1, with special emphasis on the Industrial Revolution, the economic history of the United States, and modern industrial enterprises in America. Second semester (3).

Bus. 3. Economics. A general course in the principles of economics, covering the fundamental forces governing the production, distribution, and consumption of wealth, with emphasis on value, exchange, money, rent, interest, profits, and wages. Prerequisite: sophomore standing. First semester (3).

Bus. 4. Economics. Continuation of Bus. 3. Second semester (3).

Bus. 11. Accounting. A study of the elementary principles of accounting, with sufficient practical work to develop a knowledge of accounting practice; theories of debit and credit; construction of accounts; partnership and corporation accounts; financial statements. First semester (3).

Bus. 12. Accounting. Continuation of Bus. 11. Second semester (3).

Bus. 13. Advanced Accounting. Advanced work in the field of accounting, with emphasis on the problems of assets valuation, corporation accounts, liquidations, and consolidations. Prerequisites: Bus. 11 and 12. First semester (3).

Bus. 14. Advanced Accounting. Continuation of Bus. 13. Second semester (3).

Bus. 18. Accounting for Engineers. An intensive course in the principles and practice of accounting, covering the fundamentals in one semester. Especially designed for engineering students. Second semester (3).

Bus. 21. Corporation Finance. An outline of the methods of corporations in obtaining capital, issuing securities, and extinguishing debts, with attention to the rights and obligations of security holders and to problems of corporation insolvency and dissolution. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 22. Corporation Finance. Continuation of Bus. 21. Second semester (3).

Bus. 25. Corporation Finance. An intensive course covering the fundamentals of corporation finance in one semester. Especially designed for engineering students. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 29. Money and Banking. A study of the nature of money and the principles of banking, with emphasis on coinage systems, monetary standards, paper currency, the economic functions of banks, banknote issue, various banking systems, and the Federal Reserve System. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 30. Money and Banking. Continuation of Bus. 29, Second semester (3).

Bus. 33. Labor. A one-semester course in the economics of labor, with special reference to the history of labor movements in the United States, forms of labor organizations, and the methods and policies of trades unions. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 38. Transportation. A one-semester course in the economics of transportation, with special reference to railway service and rates, railway development, railway finance, and railway regulation. Prerequisites: Bus. 3 and 4. Second semester (3).

Bus. 39. Industrial Management. A course in the essential problems of organization, financial administration, plant layout, production control, and employment policies of industrial enterprises. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 40. Industrial Management. Continuation of Bus. 39. Second semester (3).

Bus. 45. Statistics. A study of the methods of statistical description and induction, including tabular and graphic analysis and presentation. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 46. Business Cycles and Forecasting. A course dealing with the nature of the business cycle and the application of statistics to business trends, with special attention to forecasting and business barometers. Prerequisite: Bus. 45. Second semester (3).

Bus. 49. Economic Geography. A survey of the geographic factors determining economic development. with special reference to the chief economic materials and to the geographic influences responsible for the economic history and the economic position of the United States. First semester (3).

Bus. 50. Economic Geography. Continuation of Bus. 49. Second semester (3).

Bus. 56. Business Law. An intensive one-semester course in the essentials of business law. Second semester (3).

Bus. 57. Marketing. A one-semester course dealing with the distribution of economic goods, with emphasis on the chief agencies of distribution, marketing practice, wholesale and

retail, and the produce exchanges. Prerequisites: Bus. 3 and 4. First semester (3).

For Advanced Undergraduates and Graduates

Bus. 107. Advanced Economics. An advanced course in the principles of economics, dealing especially with the theory of the distribution of wealth, the nature of the productive process, the history of economic doctrines, and proposed plans of economic reform such as socialism. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 108. Advanced Economics. Continuation of Bus. 107. Second semester (3).

Bus. 115. Cost Accounting. A study of the methods used by manufacturing and commercial enterprises in ascertaining, recording, and controlling costs. Prerequisites: Bus. 11 and 12. First semester (3).

Bus. 116. Accounting Systems. A special study of various systems of accounts, with emphasis on cost accounting and production control. Second semester (3).

Bus. 123. Investments. A one-semester course which makes a detailed study, from the standpoint of the investor, of the various types of corporation and government securities, with special reference to owners' equities, comparative yields, and the machinery of investment, including stock exchange operations. Prerequisites: Bus. 21 and 22. First semester (3).

Bus. 126. Public Finance. A one-semester course dealing with government expenditures and revenues, public debts and taxation, with emphasis on the economics and the administration of federal and state taxes. Prerequisites: Bus. 3 and 4. Second semester (3).

Bus. 161. Sociology. A study of the nature and the growth of social institutions, with emphasis on evolution, racial development, social stratification, and the social problems connected with the institutions of private property, family organization, and sex. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 162. Sociology. Continuation of Bus. 161. Second semester (3).

CHEMISTRY AND CHEMICAL ENGINEERING

PROFESSORS ULLMANN, BABASINIAN, AND J. S. LONG,
ASSOCIATE POFESSORS DIEFENDERFER, CHAMBERLIN*, AND EWING,
ASSISTANT PROFESSORS BECK, ANDERSON, NEVILLE,
THEIS, SIMMONS, AND BILLINGER,
MESSRS. SMULL, HAZLEHURST, BLOOM, J. M. MILLER,
ROSE, WHITENIGHT, AND DE GRAY

Chem. 1. Elementary Chemistry. Elementary phenomena and principles of chemistry. Lectures illustrated by experiments, diagrams, working drawings, and specimens from the museum. First semester (2).

Chem. 3. Intermediate Chemistry. A course for students who pass the examination in elementary chemistry held during Freshman Week. Prerequisite: satisfactory preparation in the rudiments of chemistry. First semester (2).

Chem. 6. Advanced Chemistry. Inorganic chemistry. Lecture course with recitations. Theories of chemistry; physical and chemical methods of determining atomic and molecular weights, thermo-chemistry, dissociation, solution, catalysis, electrolysis, radio-activity, non-metallic elements and their compounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 8 and 20. First semester (3).

Chem. 7. Advanced Chemistry. Inorganic chemistry. Continuation of Chem. 6. Lecture course with recitations. Electronics, atom structure and phase rule, solid solutions, metallic elements and their compounds and alloys. Readings in original literature. Prerequisites: Chem. 1 and 11, or 3 and 13; 8 and 20. Second semester (3).

Chem. 8. Stoichiometry. Chemical problems and reactions. Second semester (1).

Chem. 11. Chemistry Laboratory. Experiments covering a systematic study of the chemical and physical properties of the more important elements and their compounds. Deposit, $15.00. First semester (2).

* Absent on leave, 1929-1930.

Chem. 12. Chemistry Laboratory. Primarily for Arts and Science and Business Administration students. An abridgment of Chem. 11. Deposit, $15.00. First semester (1).

Chem. 13. Chemistry Laboratory. Experiments designed to accompany Chem. 3. Prerequisite: satisfactory preparation in the rudiments of laboratory chemistry. Deposit, $15.00. First semester (2).

Chem. 14. Chemistry Laboratory. Primarily for Arts and Science and Business Administration students. An abridgment of Chem. 13. Deposit, $15.00. First semester (1).

Chem. 20. Qualitative Analysis. Metals and their industrially interesting compounds. The fundamental scientific principles and the practice of qualitative analysis methods. Accompanied by lectures and demonstrations. Deposit, $25.00. Second semester (3).

Chem. 21. Qualitative Analysis. Similar to Chem. 20 but shorter. Deposit, $25.00. Second semester (2).

Chem. 30. Quantitative Analysis. Practical work in the quantitative laboratory, accompanied by lectures and recitations; an introduction to gravimetric analytic method and typical fundamental volumetric processes. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. Deposit, $30.00. First semester (3).

Chem. 31. Quantitative Analysis. Continuation of Chem. 30. Analysis of metallic products, ores, and alloys of industrial interest chosen to represent the application of quantitative chemical principles to analysis. Deposit, $30.00. Second semester (3).

Chem. 33. Quantitative Analysis. Practical work in the quantitative laboratory. Analysis of simple chemical compounds, ores, and metallurgical products. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. Deposit, $25.00. First semester (3).

Chem. 35. Quantitative Analysis. Continuation of Chem. 33. Deposit, $30.00. Second semester (3).

Chem. 36. Quantitative Analysis. Practical work in the quantitative laboratory. Analysis of simple chemical com-

pounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. Deposit, $25.00. First semester (2).

Chem. 37. Quantitative Analysis. Continuation of Chem. 36. Deposit, $30.00. Second semester (2).

Chem. 39. Assaying, Coal, Gas, and Oil Analysis. Lectures and laboratory practice in the furnace assay of the ores of lead, gold, and silver, and of gold and silver bullion; cyanidization; calculations for slags and slag mixtures; laboratory practice and class-room discussion of the analysis of boiler water, mine water, coal, coke, tar, gas, petroleum, and petroleum products; colorimetry. Prerequisites: Chem. 8, and 30, 33 or 36. Deposit, $30.00. Summer session: a lecture and seven hours of laboratory work each week-day for four weeks, beginning June 2, 1930. Tuition fee, $40.00 (4).

Chem. 41. Quantitative Analysis Conference. Lectures and recitations concerning the scientific foundations and laboratory practice of Chem. 30. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. First semester (1).

Chem. 44. Quantitative Analysis Conference. Lectures and recitations pertaining to the laboratory work of Chem. 33. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21. First semester (1).

Chem. 45. Quantitative Analysis Conference. Continuation of Chem. 41. Lectures and recitations to accompany Chem. 31. Second semester (1).

Chem. 46. Quantitative Analysis Conference. Continuation of Chem. 44. Lectures and recitations to accompany Chem. 35. Second semester (1).

Chem. 48. Quantitative Analysis Conference. Lectures and recitations to accompany Chem. 36. First semester (1).

Chem. 49. Quantitative Analysis Conference. Lectures and recitations to accompany Chem. 37. Second semester (1).

Chem. 50. Summer Work. During the summer following the junior year students in the curriculum in Chemistry are required to gather industrial experience by at least eight weeks' work in industrial shops or laboratories.

Chem. 78. Chemical Engineering. An introduction to chemical engineering reviewing a number of industrial processes mainly in their engineering aspects; hydrostatics and pneumatics. Prerequisites: Chem. 6, 30, and 41. First semester (3).

Chem. 98. Physical Chemistry. An abridgment of Chem. 190 and 191 for students in the curriculum in Metallurgical Engineering. Prerequisites: Math. 5, Chem. 7 and 33. First semester (2).

Chem. 99. Research Chemistry Laboratory. Advanced stage of study or an investigation approved by the Professor of Chemistry of some novel problem, involving exhaustive laboratory and library study. Deposit, $15.00. Second semester (2).

Deposits to cover breakage, chemicals, etc., are required as indicated above. The unused portion of the deposit is returned to the student.

For Advanced Undergraduates and Graduates

Chem. 138. Industrial Organic Analysis. A laboratory study of special operations in quantitative analytical chemistry as applied to organic compounds of industrial importance; the chemical analysis of drinking water and of milk are included in this course. Prerequisites: Chem. 31 or 35, and 160. Deposit, $35.00. Second semester (3).

Chem. 147. Industrial Analysis Conference. Conferences on the principles and the applications of the laboratory methods of industrial organic analysis of Chem. 138. Prerequisites: Chem. 45 and 160. Second semester (1).

Chem. 160. Organic Chemistry. Lectures and recitations. A systematic survey of the typical compounds of carbon; their classification and general relations; study of synthetic reactions. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21; 30 or 33. First semester (4).

Chem. 161. Organic Chemistry. Continuation of Chem. 160. Second semester (3).

Chem. 162. Advanced Organic Chemistry. An advanced course in certain theories of organic chemistry. Prerequisites: Chem. 160, 165, 161, and 166, with high grades. Given in alternate years. Not given in 1930-1931. First semester (2).

Chem. 163. Chemistry of Drugs, Dyes, and Related Compounds. Prerequisites: Chem. 160, 165, 161, and 166 with high grades. Given in alternate years. Not given in 1929-1930. First semester (2).

Chem. 165. Organic Chemistry Laboratory. Determinations of specific gravities, melting points, boiling points, vapor densities; qualitative and quantitative determinations of carbon, hydrogen, nitrogen, and the halogens; preparation of pure organic compounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21; 30 or 33. Deposit, $30.00. First semester (2).

Chem. 166. Organic Chemistry Laboratory. Continuation of Chem. 165. Practical methods of saturation, nitration, reduction, diazotization, sulphonation, etc.; preparation of pure compounds; study of the properties of dyes and other commercial products. Deposit, $40.00. Second semester (3).

Chem. 167. Organic Chemistry Laboratory. Similar to Chem. 166 but shorter. Deposit, $40.00 Second semester (2).

Chem. 168. Industrial Biochemistry. The inorganic, organic, and physical chemistry of life processes and their products. Atomic and molecular structure, equilibria, colloidal state, catalysis, osmosis, synthesis, oxidation, and reduction as applying to carbohydrates, proteins, fats, lipoids, and their interrelations. Prerequisites: Chem. 160 and 165. This course may be taken without Chem. 169. First semester (2).

Chem. 169. Industrial Biochemistry Laboratory. Laboratory work to accompany Chem. 168. Prerequisites: Chem. 160 and 165. Deposit, $15.00. First semester (1).

Chem. 179. History of Chemistry. Chronological development of the science, with assigned reading. Prerequisites: Chem. 7 and 161. Second semester (1).

Chem. 180. Chemical Engineering Laboratory. Engineering fundamentals, including machinery and materials of chemical plants; transportation in plant of gases, liquids, and solids, grinding, pulverizing, screening, centrifuging, fuels, and combustion engineering; lay-out and cost data of a simple manufacturing plant; laboratory work including study of some of these fundamentals. Visits to industrial plants for inspection

of large units are an integral part of the course. Prerequisites: Chem. 31, 45, 78, 160, and 165. Deposit, $25.00. First semester (3).

Chem. 181. Chemical Engineering. Continuation of Chem. 180. Discussion of unit engineering procedure. Processes considered: filtration, sedimentation, electric and magnetic separation, solution, stirring, mixing, crystallization, drying, evaporation, distillation, calculations of engineering design. Assigned reading in industrial chemistry and visits to industrial plants are incidental to the course. Second semester (3).

Chem. 185. Chemical Engineering Practice. Comprehensive studies in nearby manufacturing plants of a few processes involving one or more unit engineering operations, these studies usually occupying time covering whole days or multiples thereof. Deposit, $10.00. Second semester (1).

Chem. 190. Physical Chemistry. Lectures and recitations. Prerequisites: Math. 5, Chem. 7, and 31 or 35. First semester (3).

Chem. 191. Physical Chemistry. Continuation of Chem. 190. Second semester (2).

Chem. 192. Electrochemistry. Chemical reactions in gases, solutions, and molten electrolytes caused by the electric current. Quantitative relations between electromotive force, electrical energy, and chemical energy. Efficiency and applicability of typical processes. Prerequisites: Math. 5, Chem. 7, and 31 or 35. First semester (1).

Chem. 195. Physical Chemistry Laboratory. Physico-chemical measurements. Prerequisites: Math. 5, Chem. 7, and 31 or 35. Deposit, $10.00. First semester (1).

Chem. 196. Physical Chemistry Laboratory. Continuation of Chem. 195. Deposit, $10.00. Second semester (1).

Chem. 197. Electrochemistry Laboratory. Experimental study of electrochemical reactions. Current efficiencies, electromotive force measurements and overvoltage; transport numbers; electrochemical preparations. Prerequisites: Math. 5, Chem. 7, and 31 or 35. Deposit, $5.00. First semester (1).

For Graduates

The prerequisites for graduate work in Chemistry as a major study are: Inorganic Chemistry (8), Qualitative Analysis (4), Quantitative Analysis (8), Organic Chemistry (10), Physical Chemistry (5), Physics (12), and Mathematics, including Calculus, (12). Students of exceptional ability may be able to make up minor deficiencies while carrying graduate work. If the deficiencies are serious, a student can hardly expect to complete the requirements for the Master's degree within the minimum time.

Chem. 200. Inorganic Chemistry Research. Investigation in the field of inorganic chemistry and in drying oils and their metallic salts. Prerequisites as in the statement above introductory to graduate courses. Deposit, $30.00. First semester (4). Professor Long, Assistant Professor Neville.

Chem. 201. Inorganic Chemistry Research. Continuation of Chem. 200. Deposit, $30.00. Second semester (4). Professor Long, Assistant Professor Neville.

Chem. 202. Advanced Inorganic Chemistry. A course of conference and reading in the generalizations of inorganic chemistry. Prerequisites as in the statement above introductory to graduate courses and a reading knowledge of German and French. First semester (2). Professor Long, Assistant Professor Neville.

Chem. 203. Advanced Inorganic Chemistry. Continuation of Chem. 202. Second semester (2). Professor Long, Assistant Professor Neville.

Chem. 230. Quantitative Analysis Research. Investigation of problems in analytic procedures. Prerequisites as in the statement above introductory to graduate courses. Deposit, $30.00. First semester (4). Professor Ullmann, Associate Professor Diefenderfer.

Chem. 231. Quantitative Analysis Research. Continuation of Chem. 230. Deposit, $30.00. Second semester (4). Professor Ullmann, Associate Professor Diefenderfer.

Chem. 234. Radiation Methods. The application of radiation methods, mainly X-ray methods, to chemical and industrial

chemical problems. First semester (2). Assistant Professor Anderson.

Chem. 235. Radiation Methods. Continuation of Chem. 234. Second semester (2). Assistant Professor Anderson.

Chem. 244. Radiation Methods Laboratory. Laboratory practice in connection with Chem. 234. Deposit, $10.00. First semester (1). Assistant Professor Anderson.

Chem. 245. Radiation Methods Laboratory. Continuation of Chem. 244. Deposit, $10.00. Second semester (1). Assistant Professor Anderson.

Chem. 260. Organic Chemistry Research. Investigation of a problem in organic chemistry with particular reference to the dye industry. Prerequisite: a course substantially equivalent to Chem. 161 and 165. Deposit, $30.00. First semester (4). Professor Babasinian.

Chem. 261. Organic Chemistry Research. Continuation of Chem. 260. Deposit, $30.00. Second semester (4). Professor Babasinian.

Chem. 265. Advanced Organic Preparations. Mainly a laboratory course. Prerequisite: Chem. 165. Deposit, $30.00. First semester (2). Professor Babasinian.

Chem. 266. Advanced Organic Preparations. Continuation of Chem. 265. Deposit, $30.00. Second semester (2). Professor Babasinian.

Chem. 280. Industrial Chemistry and Chemical Engineering Research. Investigation of a problem in chemical engineering or in industrial chemistry. Prerequisites: for problems in industrial chemistry as in the statement above introductory to graduate courses; for investigation of a problem in chemical engineering, an undergraduate curriculum in chemical engineering substantially equivalent to the curriculum in this University. Deposit, $30.00. First semester (4). Professor Ullmann, Associate Professor Chamberlin, Assistant Professor Theis, Assistant Professor Simmons, Assistant Professor Billinger.

Chem. 281. Industrial Chemistry and Chemical Engineering Research. Continuation of Chem. 280. Deposit, $30.00. Second semester (4). Professor Ullmann, Associate Professor Chamberlin, Assistant Professor Theis, Assistant Professor Simmons, Assistant Professor Billinger.

Chem. 284. Tanning Technology. Special development of inorganic, organic, and physical chemistry and allied sciences as applied to control and research in tanning and in the manufacture of leather. Principles of design and operation of apparatus and machinery of the leather industry. Prerequisites as in statement above introductory to graduate courses. First semester (3). Assistant Professor Theis.

Chem. 285. Tanning Technology. Continuation of Chem. 284. Second semester (3). Assistant Professor Theis.

Chem. 286. Tanning Engineering Practice. A laboratory course to accompany Chem. 284. Experimental scientific studies in a small tannery of modern design of the major tanning and leather finishing processes. Visits to and studies in industrial tanneries. Deposit, $30.00. First semester (3). Assistant Professor Theis.

Chem. 287. Tanning Engineering Practice. Continuation of Chem. 286. Deposit, $30.00. Second semester (3). Assistant Professor Theis.

Chem. 290. Physical Chemistry Research. Investigation of a problem in physical chemistry; vapor pressure and calorimetric studies in the constitution of inorganic salts. Prerequisites: the equivalent of Chem. 190, 191, 195, and 196. Deposit, $30.00. First semester (4). Associate Professor Ewing.

Chem. 291. Physical Chemistry Research. Continuation of Chem. 290. Deposit, $30.00. Second semester (4). Associate Professor Ewing.

Chem. 292. Theoretical Chemistry: Kinetics. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 190, 191, 195, and 196. Given in alternate years. Not given in 1930-1931. First semester (3). Dr. Hazlehurst.

Chem. 293. Theoretical Chemistry: Kinetics. Continuation of Chem. 292. Second semester (3). Dr. Hazlehurst.

Chem. 294. Theoretical Chemistry: Thermodynamics. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 190, 191, 195, and 196. Given in alternate years. First semester (3). Dr. Hazlehurst.

Chem. 295. Theoretical Chemistry: Thermodynamics. Continuation of Chem. 294. Second semester (3). Dr. Hazlehurst.

Chem. 296. Colloids. Theories and applications of colloidal behaviour. Lectures and seminar with occasional demonstrations. Prerequisites as in statement introductory to graduate courses. First semester (3). Assistant Professor Neville.

Chem. 297. Catalysis. Theories of catalytic mechanism. Preparation, activation, and control of catalysts. The applications of catalysis in various types of chemical reactions and in certain industrial processes. Lectures, seminar, demonstrations. Prerequisites as in statement above introductory to graduate courses. Second semester (3). Assistant Professor Neville.

Chem. 298. Advanced Physical Chemistry. A course arranged to go forward from courses in elementary physical chemistry. Collateral reading required. Prerequisites as in the statement above introductory to graduate courses. Second semester (3). Associate Professor Ewing.

Chem. 299. Physical Chemistry Methods. Advanced course in methods of physical chemistry laboratory practice. Prerequisites: the equivalent of Chem. 195 and 196. Deposit, $30.00. First semester (2). Associate Professor Ewing.

CIVIL ENGINEERING

PROFESSORS FOGG, WILSON, AND SLATER,
ASSOCIATE PROFESSORS S. A. BECKER AND FULLER,
ASSISTANT PROFESSORS PAYROW, UHLER, AND JENSEN,
MESSRS. GETCHELL AND NETTLES

C.E. 1. Engineering Drawing. The use of drawing instruments; lettering and tracing; mechanical drawing of objects; simple projections; isometric drawing. First semester (2).

C.E. 2. ENGINEERING DRAWING. The descriptive geometry of projections, intersections, and developments; plans, elevations, and sections of simple structural details. Prerequisite: C.E. 1. Second semester (2).

C.E. 6. LAND AND TOPOGRAPHIC SURVEYING. The theory and practice of land surveying, including computation of areas, dividing land, determining heights and distances; map drawing and topographic signs; field work with level and transit; map drawing from students' field notes; theory and use of stadia; detailed field work in rough country; pen topography and contour maps. Prerequisites: plane trigonometry and engineering drawing. Summer session: a recitation and seven hours of field work each week-day for four weeks, beginning June 2, 1930. Tuition fee, $40.00 (4).

C.E. 7. RAILROAD SURVEYING. Reconnaissance, preliminary and location methods, with the theory of curves. Prerequisite: C.E. 6. Summer session: a recitation and seven hours of field work each week-day for two weeks, immediately following C.E. 6. Tuition fee, $20.00 (2).

C.E. 8. MECHANICS OF MATERIALS. The elasticity and strength of timber, brick, stone, and metals; theory of beams, columns, and shafts, with the solution of many practical problems. Prerequisites: Phys. 1 and 4, and Math. 5. First semester (4).

C.E. 9. MECHANICS OF MATERIALS. An abridgment of C.E. 8. Prerequisites: Phys. 1 and 6 and Math. 5. First semester (3).

C.E. 10. MATERIALS TESTING LABORATORY. Fourteen experiments made by each student on wood, iron, and steel to determine the action of materials under stress and to study the physical properties of materials of construction. The Fritz Engineering Laboratory, where this work is done, is equipped with 20,000, 50,000, 300,000, and 800,000-pound machines for tension, compression, and flexure, a 50,000-inch-pound machine for torsion, and other apparatus for special work. Concurrent with C.E. 8 or 9. Fee. $5.00. First semester (1).

C.E. 11. RAILROADS. Theory of curves and turnouts; preparation of profiles and maps; the computation of earth work and estimates of cost; the construction of road-bed, including ballast, cross ties, rails, switches, culverts, and other details. Prerequisite: C.E. 7. First semester (3).

C.E. 12. Hydraulics. Hydrostatics and theoretical hydraulics; the flow of water through orifices, weirs, tubes, pipes, and channels; naval hydromechanics; hydraulic motors; the solution of many practical problems. Prerequisites: Phys. 1 and 4 and Math. 5. Second semester (3).

C.E. 13. Hydraulics. An abridgment of C.E. 12. Prerequisites: Phys. 1 and 4 and Math. 5. First or second semester (2).

C.E. 14. Hydraulics Laboratory. Fourteen experiments made by each student in the hydraulic section of the Fritz Engineering Laboratory, which is equipped with pumps, weirs, turbines, water-wheels, meters, and other apparatus for special work. Concurrent with C.E. 12 or 13. Fee, $5.00. First or second semester (1).

C.E. 15. Stresses in Framed Structures. Analytical and graphical determination of stresses in roof and bridge trusses under dead, live, and wind loads; locomotive wheel loads on plate girders and bridge trusses. Prerequisite: C.E. 8 or 9. Second semester (4).

C.E. 16. Highway Engineering. The location, construction, and maintenance of roads and pavements; highway design. Prerequisite: C.E. 6; highly desirable, C.E. 7. Second semester (3).

C.E. 20. Graphic Statics. Analysis of the stresses in roof trusses and miscellaneous structures by the force polygon; applications of the equilibrium polygon to the discussion of beams and girders. Prerequisites: Phys. 1 and 4, Math. 20. First semester (2).

C.E. 25. Foundations. Construction and design. Concurrent with C.E. 125. Second semester (2).

C.E. 27. Contracts and Specifications. Lectures on the essentials of contracts and specifications for engineering structures. Prerequisite: junior standing. First semester (3).

C.E. 29. Summer Work in Civil Engineering. During the summer following the junior year, students are required to spend at least eight weeks in shop work or on engineering construction, and are required to submit a written report on same.

C.E. 30. Structural Steel Design. A special course for seniors in Mining Engineering, with special attention given to the design of mine structures. Prerequisites: C.E. 9 and 20. Second semester (3).

C.E. 50. Thesis. First or second semester.

For Advanced Undergraduates and Graduates

C.E. 118. Structural Steel Design. Lectures and recitations. Theory of structural steel design and complete calculations for a through plate girder railroad bridge and for a highway truss bridge; design of mill buildings and miscellaneous structures. Concurrent with C.E. 119. Prerequisite: C.E. 15. First semester (4).

C.E. 119. Bridge and Building Construction. Design and working drawings for structures, including a plate girder railway bridge, a highway truss bridge, and a mill building. Concurrent with C.E. 118. First semester (2).

C.E. 121. Hydraulic and Water Power Engineering. Three recitations and one drawing-room exercise a week devoted to systems of water supply, including purification of systems, reservoirs, pipe lines, pumping plants; the design of a water supply distribution system; the measurement of flow in open channels by means of tubes and meters; water power; irrigation. Prerequisite: C.E. 12 or 13. First semester (4).

C.E. 122. Geodesy. Recitations, calculations, field work. Precise leveling; adjustment of instruments and investigation of their systematic errors; elements of least squares and their application to the adjustment of triangulations; field work in triangulation, in determination of azimuth, and with the plane table. Prerequisite: C.E. 6. Second semester (3).

C.E. 123. Railroads and Terminals. Maintenance of way and the elements of railroad operation. Lectures on the economics of railroad location; the arrangement of yards, stations, and terminals; train resistance; the application of electricity to the operation of railroads. Prerequisite: C.E. 11. Second semester (3).

C.E. 124. Higher Structures. Theory of continuous, draw, cantilever, and suspension bridges; also metallic arches; theory

and design of masonry walls, dams, and arches; theory of deflections and applications to statically indeterminate structures. Prerequisite: C.E. 15. Second semester (3).

C.E. 125. Reinforced Concrete Design. Theory of reinforced concrete; design of reinforced concrete buildings, arches, and miscellaneous structures. Prerequisite: C.E. 8 or 9; highly desirable: C.E. 15 and 118. Second semester (3).

C.E. 126. Cement and Concrete Laboratory. The manufacture, properties, and testing of cement, mortar, and concrete. All the standard tests made by each student on cement and on reinforced concrete beams and columns in the Fritz Engineering Laboratory. Concurrent with C.E. 125. Fee, $5.00. Second semester (1).

C.E. 128. Sanitary Engineering. Systems of sewerage and methods of sewage treatment and disposal; the design of a sewerage system; house drainage. Prerequisite: C.E. 12 or 13. First semester (3).

C.E. 131. Advanced Sanitary Engineering. Continuation of C.E. 128. Second semester (3).

C.E. 132. Advanced Highway Engineering. Continuation of C.E. 16. Second semester (3).

For Graduates

The following courses are open to engineering graduates only. The prerequisite for any course listed is the undergraduate course of similar title.

Math. 217 and 218, Theory of Elasticity, may be included in a graduate major in Civil Engineering.

C.E. 201. Structures. The design and investigation of statically indeterminate structures of steel and reinforced concrete, including arches. Preparation of general plans and estimates, and the economic comparison of different types of bridges. First semester (4). Professor Fogg.

C.E. 202. Structures. Continuation of C.E. 201. Second semester (4). Professor Fogg.

C.E. 203. Materials. The properties of materials of construction, with special reference to research, specification, and

testing. Original researches by the student in the laboratory. First semester (5). Professor Slater, Associate Professor Fuller.

C.E. 204. Materials. Continuation of C.E. 203. Second semester (5). Professor Slater, Associate Professor Fuller.

C.E. 205. Railroad Engineering. The economic location of railroads, as influenced by probable volume of traffic and cost of construction and operation; a study of the virtual profile in reducing gradients, with discussion of special cases. First semester (2). Professor Wilson.

C.E. 206. Railroad Engineering. Continuation of C.E. 205. Second semester (2). Professor Wilson.

C.E. 207. Sanitary and Hydraulic Engineering. The designing of reservoirs, tanks, and pipe lines for water supply systems, and of sewers and other appurtenances for sewerage systems. Inspection of existing plants, with reports thereon. First semester (4). Assistant Professor Payrow.

C.E. 208. Sanitary and Hydraulic Engineering. Continuation of C.E. 207. Second semester (4). Assistant Professor Payrow.

ECONOMICS

See Business Administration

EDUCATION

See Philosophy, Psychology, and Education

ELECTRICAL ENGINEERING

PROFESSORS BARKER AND SEYFERT, ASSOCIATE PROFESSOR BEAVER, ASSISTANT PROFESSORS GRUBER, A. R. MILLER, HIBSHMAN, AND CREEDY, MESSRS. ANDRESS AND MAYLOTT

E.E. 1. Principles of Electrical Engineering. Electric units and electric circuits; electric power and energy; resistance computations; electrolytic conduction; the magnetic circuit; the magnetic field. Prerequisites: Phys. 1, Math. 2, 3, and 20. (Phys. 6, 7 and Math. 4 simultaneously.) First semester (1).

E.E. 2. Direct-current Machinery. Study of induced and generated potentials; magnetic properties of iron and steel; force on a conductor; the construction, operation, and control of direct-current machinery, armature windings; characteristic curves. Illustrative problems. Prerequisites: Phys. 6, 7, Math. 4, and E.E. 1. Second semester (3).

E.E. 3. Dynamo Laboratory, Elementary. Introductory course supplementing the class work of E.E. 2. Experimental studies and tests of direct-current generators, motors, and appliances, for characteristics, regulation, efficiency, insulation, etc. Prerequisites: E.E. 1, Phys. 6 and 7. (E.E. 2 simultaneously.) Fee, $6.00. Second semester (1).

E.E. 4. Alternating Currents, Elementary. Alternating-current conceptions; study of circuit laws for series and parallel circuits containing R, L and C; vector methods; complex quantities; single- and poly-phase circuits and measurement of power; alternating-current instruments. Lectures, recitations, and problem work. Prerequisites: Math. 5, Phys. 6 and 7, and E.E. 2. First semester (3).

E.E. 5. Dynamo Laboratory, Intermediate, Direct Current. Continuation of E.E. 3. Advanced testing of direct-current machines. Alternating-current circuit experiments. Prerequisites: E.E. 2 and 3. Fee, $6.00. First semester (1).

E.E. 6. Alternating Currents, Advanced. Continuation of E.E. 4. Non-sinusoidal waves (Fourier analysis); mutual inductance; transformer; the induction motor; introduction to synchronous machines. Lectures, recitations, and problem work. Prerequisites: Math. 6, E.E. 4. Second semester (3).

E.E. 8. Dynamo Laboratory, Intermediate, Alternating Current. Continuation of E.E. 5. Advanced testing of direct-current machines; alternating-current machinery testing begun. Prerequisites: E.E. 4 and 5. Fee, $6.00. Second semester (1).

E.E. 9. Dynamo Testing, Direct Current. Lectures on the methods of testing electrical machinery and apparatus, including direct-current generators, motors, and motor generator sets; special methods of testing large machines; experimental and commercial tests as carried out by the large man-

ufacturing companies. Prerequisites: E.E. 4 and 5. Second semester (1).

E.E. 10. Dynamo Testing, Alternating Current. Lectures on testing of alternating-current machinery and apparatus, including generators, motors, synchronous converters, transformers, induction regulators, etc. Prerequisites: E.E. 6, 8, and 9. First semester (1).

E.E. 11. Dynamo Laboratory, Advanced. Advanced experimental studies and tests of direct- and alternating-current generators and motors, synchronous converters, transformers, and auxiliary apparatus. Prerequisites: E.E. 6, 8, and 9. Fee, $12.00. First semester (3).

E.E. 15. Electrical Engineering Seminar. A weekly meeting held in the department lecture room for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics. Prerequisite: E.E. 6. First semester (1).

E.E. 16. Electrical Engineering Seminar. Continuation of E.E. 15. Prerequisite: E.E. 15. Second semester (2).

E.E. 19. Dynamo Laboratory, Advanced. Continuation of E.E. 11. Advanced alternating-current machinery testing. Prerequisites: E.E. 10, 11, and 12. Fee, $12.00. Second semester (2).

E.E. 20. Electric Traction. The construction, equipment, and operation of different types of electric railways. The application of electric traction under steam railroad conditions; the dynamics of electric train movements; predeterminations of speed-time curves and the power required for different types of runs; choice of car equipment; cost of construction and of operation; testing of railway systems. Prerequisites: E.E. 12 and 114. Second semester (3).

E.E. 21. Electrical Communication, I. The principles of telephone and telegraph communication. Class work includes a physical and mathematical analysis of the fundamental telephone and telegraph circuits and constants, the propagation of electric waves along wires and cables, transmission problems and practice, and carrier current communication. Laboratory work consists of experimental checks upon the theory de-

veloped in the class room. Prerequisite: E.E. 4 or 54. Fee, $6.00. Second semester (3).

E.E. 23. Thesis for Degree of B.S. in Electrical Engineering. Each candidate for this degree may elect to present a thesis upon a subject chosen by the candidate during the first semester of the senior year. The work upon which the thesis is based may be done during either the first or second semester of the senior year and consists in part of reading from references furnished by the professor in charge, and in part of independent work in theory, experimental research, or designing. Reports of progress on thesis work required from time to time during the semester. Much importance is attached to the thesis as evidence of the candidate's ability to carry out an independent investigation. First or second semester (3).

E.E. 24. Summer Work. During the vacation following the junior year each student in Electrical Engineering is required to spend at least eight weeks in getting practical experience in some approved shop or plant. A written report on the shop or plant, and the experience gained therein, is due December 3 These reports should contain such calculations, photographs, drawings, and plots as each individual case may require.

E.E. 26. Electrical Communication, II. A survey of the methods of electrical communication, principles of various systems of wire telegraphy, wire telephony, radio telegraphy and telephony, and laboratory measurements on radio and other communication circuits. Prerequisite: E.E. 4 or 52. Fee, $6.00 First semester (3).

E.E. 50. Dynamos and Motors, General. An abbreviated course adapted to those students who do not continue this subject in the following year; the principles and practice of direct-current engineering, including: the elementary theory, construction, operation, and control of direct-current generators and motors, electromagnets, solenoids; illustrative problems. Prerequisite: Phys. 5. First or second semester (2).

E.E. 51. Dynamo Laboratory, Beginning. Introductory course supplementing the class work of E.E. 50. Experimental studies and tests of direct-current generators and motors for characteristics, regulation, efficiency, etc. Requisite: E.E. 50 simultaneously. Fee, $6.00. First or second semester (1).

E.E. 52. Alternating Currents, General. A course following E.E. 50; the principles and practice of alternating-current engineering; the theory of alternating currents with applications to alternating-current generators, motors, transformers, and other apparatus; systems of transmission and distribution. Prerequisite: E.E. 50. First or second semester (2).

E.E. 53. Dynamo Laboratory, Intermediate. Continuation of E.E. 51, supplementing the class work of E.E. 52 and 54. Advanced testing of direct-current machines; practice in operating and testing alternating-current apparatus. Prerequisites: E.E. 50 and 51 (E.E. 52 or 54 simultaneously). Fee, $6.00. First or second semester (1).

E.E. 54. Electrical Engineering, Applications. A course particularly adapted to students who do not specialize further along electrical lines; systems of generation, transmission, distribution, and utilization taken up in order; under utilization special attention given to the application of electric motors to various industries; estimates and costs; problems. Prerequisites: E.E. 50, 51, and 52. Second semester (2).

E.E. 55. Dynamo Laboratory, Advanced. Continuation of E.E. 53, consisting of advanced direct- and alternating-current studies and tests. Primarily for non-electrical students taking more than the usual two semesters of dynamo laboratory. Prerequisites: E.E. 52 and 53. Fee, $6.00. Second semester (1).

E.E. 56. Electrical Machinery. An abbreviated course covering the elementary principles of direct- and alternating-current machinery adapted to students requiring a minimum of electrical engineering, including: construction and operation of direct- and alternating-current generators and motors, transformers, converters, and related equipment. Prerequisite: Phys. 5. Second semester (2).

E.E. 57. Dynamo Laboratory, Combined. A brief course covering the simpler tests on direct- and alternating-current circuits and apparatus accompanying the class work of E.E. 56. Requisites: E.E. 56 simultaneously. Fee, $6.00. Second semester (1).

For Advanced Undergraduates and Graduates

E.E. 112. Alternating-current Machinery. Study of the structural details, characteristics, and operation of alternators, alternating-current motors, synchronous converters, and transformers. Prerequisite: E.E. 6. First semester (3).

E.E. 113. Electrical Design. Application of electric, magnetic, and mechanical principles to the design of direct-current generators and transformers; predetermination of characteristics and performance; armature winding. Lectures, recitations, problems, drafting. Prerequisites: E.E. 6 and 8. First semester (3).

E.E. 114. Electric Stations. Consideration of prime movers; generating machinery, discussion of types and operation; auxiliary machinery and transformers; storage batteries and their application; switch-boards, measuring and protective devices; design and arrangement; station characteristics; substations; operation and management; methods and principles of rate making; visits to neighboring plants. Prerequisites: C.E. 13, M.E. 23, and E.E. 6 or 52. First semester (2).

E.E. 117. Electrical Design. Continuation of E.E. 113. Application of electric, magnetic, and mechanical principles to the design of alternators and induction motors; predetermination of characteristics and performance; rotor and stator windings. Lectures, recitations. problems, and drafting. Prerequisites: E.E. 11 and 112. Second semester (3).

E.E. 118. Electric Power Transmission. The long distance transmission of power by electricity; mathematical determination of line constants, regulation, interference, transients, etc.; switching and protection of circuits. Prerequisites: E.E. 112 and 114. Second semester (3).

E.E. 122. Electric Transients. A recitation, lecture, and laboratory course in elementary electric transients, designed to give a physical and quantitative idea of the more common transients occurring in electrical circuits, apparatus, and transmission lines; oscillograms of transients obtained in the laboratory to substantiate the theory of the classroom. Prerequisites: Math. 6, E.E. 10, 11, and 112. Fee, $6.00. Second semester (3).

E.E. 127. Dielectric Phenomena. A study of the fundamental principles of electrostatic and magnetic fields, laws of corona, etc., and their applications in the field of electrical engineering. Prerequisites: E.E. 112, Math. 21. Second semester (3).

For Graduates

For graduate students intending to take their major subjects in Electrical Engineering a preparation equivalent to the work required for the B.S. in E.E. degree is necessary.

Math 125, Operational Calculus, may be included in a graduate major in Electrical Engineering.

E.E. 203. Electrical Design. A course consisting of predeterminations by calculation of the characteristics, regulation, and performance of electrical machinery. Analysis and use of designing constants. Design of special machines. First semester (3). Associate Professor Beaver.

E.E. 204. Electrical Design. Continuation of E.E. 203. Second semester (3). Associate Professor Beaver.

E.E. 207. Electrical Testing. Special experimental research in electrical engineering; tests of magnetic properties of iron and steel; investigation of the series single-phase alternating-current motor; leakage reactance of induction motors; regulation of alternators; machine transients; polyphase testing. Fee, $12.00. First semester (3). Professor Seyfert and Assistant Professor Hibshman.

E.E. 208. Electrical Testing. Continuation of E.E. 207. Fee, $12.00. Second semester (3). Professor Seyfert and Assistant Professor Hibshman.

E.E. 209. Radio Communication. The theory underlying the various sending and receiving systems, and the propagation of electromagnetic waves, combined with experimental work in connection with the department's wireless equipment. First semester (2). Professor Seyfert.

E.E. 210. Radio Communication. Continuation of E.E. 209. Second semester (2). Professor Seyfert.

E.E. 211. Electric Transients. The theory of transients in the more complicated types of electrical circuits, electrical apparatus, and transmission lines, as applied in electrical engineering; oscillograms of all transient phenomena discussed taken in the laboratory. Two lectures and one laboratory period per week. Fee, $6.00. First semester (3). Assistant Professor Miller.

E.E. 212. Electrical Transients. Continuation of E.E. 211. Treatment of circuits and transients by operational calculus methods. Fee, $6.00. Second semester (3). Assistant Professor Miller.

E.E. 213. Advanced Theory of Power Transmission. A course covering methods of determining the exact solution of transmission line problems; study of line transients and short circuits; problems on power limits and stability of systems. First semester (3). Professor Seyfert.

E.E. 214. Advanced Theory of Power Transmission. Continuation of E.E. 213. Second semester (3). Professor Seyfert.

ENGLISH

PROFESSORS SMITH AND LUCH, ASSISTANT PROFESSORS RILEY, MAC DOUGALL, AND RHOADS, MESSRS. BRAUNLICH, SEVERS, FINCH, PARKS, SCHENCK, SLOANE, AND GRAMLEY

Engl. 0-1-2-3a and 3b. Freshman Composition and Literature. The freshmen are distributed, upon the basis of preliminary tests given during Freshman Week, into three groups; low, middle, and high. A schedule of the year's program and credit hours for each group is given below:

Group	First Semester	Credit Hours	Second Semester	Credit Hours
Low	English 0	0	English 1	3
Middle	English 1	3	English 2	3
High	English 3a	3	English 3b	3

Engl. 1 and 2 constitute the minimum freshman requirement. Since no college credit is given for Engl. 0, the students in the low group are required to take Engl. 2 either in summer session or during the second year, in order to complete the six

required hours. A student whose work shows that he has been placed in the wrong group may be transferred to the higher or to the lower group at any time during the year, if his instructor recommends and the head of the department approves the transfer. First and second semesters (3).

ENGLISH LITERATURE AND COMPOSITION

All students majoring in English literature are required to take Engl. 4, 5; 123 and 124, or equivalent courses on the recommendation of the advisor in charge of the major work.

Normally a major in English should elect two English courses in the junior year, and at least two in the senior year. Students working for honors in English Literature should elect Engl. 129, 130. Students not working for honors may make up the required hours in the junior and senior years from courses 6, 7; 18, 19; 20, 21; 31, 32; 121, 122; 125; 126; 127; 128.

Majors are advised to elect courses in English History and in Fine Arts; Lat. 21, 22, and Ger. 10.

Engl. 4. A STUDY OF THE DRAMA. Reading and critical study of types of the drama; theories of the drama; the drama and the stage; the drama as a criticism of life. Required of English majors. Prerequisites: Engl. 1 and 2, or 3a and 3b. First semester (3).

Engl. 5. A STUDY OF THE DRAMA. Continuation of Engl. 4. Second semester (3).

Engl. 6. THE MODERN ESSAY. An advanced composition course in writing essays and narrative types with a study of leading modern essayists. Prerequisites: Engl. 1 and 2. First semester (3).

Engl. 7. THE SHORT STORY. A critical study of the short story, English, American, and continental. Class discussions, extensive collateral reading, and reports. Prerequisites: Engl. 1 and 2, or 3a and 3b. Second semester (3).

Engl. 17. CONTEMPORARY DRAMA. A study of types of the drama. Summer session (3).

ENGL. 18. THE NOVEL. A study of types of the novel. Reading and reports. Lectures on the history of the novel in

England and America. Prerequisites: six hours of English. Not given in 1930-1931. First semester (3).

Engl. 19. THE NOVEL. Continuation of Engl. 18. Not given in 1930-1931. Second semester (3).

Engl. 20. AMERICAN LITERATURE, 1607-1855. Lectures, textbook, and supplementary reading. Prerequisites: six hours of English. First semester (3).

Engl. 21. AMERICAN LITERATURE, 1855 TO THE PRESENT. Continuation of Engl. 20. Second semester (3).

Engl. 31. MILTON AND THE SEVENTEENTH CENTURY. A survey of the life and literature of the seventeenth century with special study of Milton. Prerequisites: six hours of English. First semester (3).

Engl. 32. EIGHTEENTH CENTURY LITERATURE. A study of the writings of Pope, Swift, and other Augustans, followed by a study of Dr. Johnson and his circle. Prerequisites: six hours of English. Second semester (3).

Engl. 40. REPORT WRITING. A study of all types of reports which the engineer or business man must write, from the short letter report to the long technical report. Information reports, examination reports, recommendation reports, progress reports, experimental research reports. Prerequisites: Engl. 1 and 2. Each semester (3).

Engl. 41. BUSINESS CORRESPONDENCE. The basic principles of letter writing for the business man and engineer. The psychology of advertising is studied as the basis of practice in writing letters of inquiry, application letters, sales letters, adjustment letters, credit letters, letters of reply, and collection letters. Prerequisite: Engl. 1 and 2. Each semester (3).

For Advanced Undergraduates and Graduates

Engl. 121. CONTEMPORARY LITERATURE. A study of present-day American writers exclusive of the drama. Collateral readings and reports. Prerequisite: junior standing or the consent of the Head of the Department. First semester (3).

Engl. 122. CONTEMPORARY LITERATURE. A study of present-day English and European writers exclusive of the drama.

Collateral reading and reports. Prerequisite: junior standing or the consent of the Head of the Department. Second semester (3).

Engl. 123. Shakespeare. A rapid reading of Shakespeare's minor plays, and a critical study of the principal tragedies and comedies. Required of English majors. Prerequisites: twelve hours of English. First semester (3).

Engl. 124. Shakespeare. Continuation of Engl. 123. Second semester (3).

Engl. 125. English Literature of the Romantic Era. Prerequisites: twelve hours of English. Not given in 1930-1931. First semester (3).

Engl. 126. English Literature of the Victorian Age. Prerequisites: twelve hours of English. Not given in 1930-1931. Second semester (3).

Engl. 127. Old English Literature. A study of the history and literature of the Anglo-Saxon period in Old English and in translation, with special attention to the types of Old English poetry. First semester (3).

Engl. 128. Chaucer. A study of the life and principal works of Chaucer, with some attention to his chief contemporaries. Lectures, readings, class discussions, and reports. Second semester (3).

Engl. 129. Literary Criticism. A course aimed to correlate and unify the student's previous work in literature by means of wide reading in critical literature and discussions of theories and schools of criticism. Open only to majors reading for honors and other specially qualified students. First semester (3).

Engl. 130. Literary Criticism. Continuation of Engl. 129. Second semester (3).

PUBLIC SPEAKING

Engl. 10. Introductory Public Speaking. A foundation course in the various types of public address. Particular stress is laid in this course upon ability to think in spoken discourse and to attain ease and proficiency in the use of body and voice. First semester (3).

Engl. 11. Advanced Public Speaking. A course giving training beyond that of Engl. 10. Analysis of the psychological aspects of the speech situation; study of models; delivery of speeches prepared for audiences of various kinds. Second semester (3).

Engl. 12. Argumentation and Debate. A study of the principles of argumentation and debate, and practice in debating. First semester (3).

Engl. 14. The Oration and Long Speech. The preparation of three or four long addresses which may be delivered before such audiences as are provided by the Lehigh Students Speakers Bureau. Second semester (3).

JOURNALISM

Students majoring in journalism take Engl. 43, 44, 46, 47, 50, and 51 and either Engl. 45, 52, or 53. They must also complete four semesters of Engl. 48. Other requirements include twelve hours to be chosen from the following courses: Engl. 4, 5, 6, 7, 123, and 124 or such equivalents as may be allowed; and also Hist. 25 and 26, Govt. 51 and 52, Psych. 1 and 4, and Bus. 3 and 4. During the junior or senior year a three-day field trip to New York is taken to visit several plants connected with metropolitan journalism. The comprehensive examination in journalism will include the content of the courses studied in the sophomore, junior, and senior years.

Engl. 42. Business News Writing. Writing for publication as an avocation for the scientific or business man. Reporting and writing business and scientific news. Writing for house organs, employes' magazines, trade and technical journals. Prerequisites: Engl. 1 and 2. Fee, $1.50. Each semester (3).

Engl. 43. Newspaper Reporting and Writing. A beginning course in newspaper journalism. Definition of news; news values and reader interest; structure of the news story; newspaper English; how to report and write simple news stories. During the three-hour laboratory period the class organizes as a newspaper staff and "covers" the city of Bethlehem. Copy written in the laboratory is read immediately and handled as it would be in a newspaper editorial room. Prerequisites: Engl. 1 and 2. Fee, $2.00. First semester (3).

Engl. 44. Advanced Newspaper Reporting and Writing. Continuation of Engl. 43. A laboratory course in the reporting and writing of particular types of news. Fee, $2.00. Second semester (3).

Engl. 45. Feature and Magazine Writing. Writing all kinds of feature articles from newspaper "brighteners" to essays of opinion, personality sketches, etc., of magazine length. A different current magazine is studied each week as a model. Prerequisites: Engl. 42 or 43. Fee, $1.50. Second semester (3).

Engl. 46. Newspaper Editing and Copy Reading. A study of the problems and technique of the newspaper copy reader and news editor. During the laboratory period members of the class act as editors and copy readers with members of Engl. 43 as their staff. Prerequisites: Engl. 43 and 44. Fee, $1.50. First semester (3).

Engl. 47. The Headline and Makeup. A study of the problems and technique of the newspaper managing editor and makeup man. Prerequisite: Engl. 46. Fee, $1.50. Second semester (3).

Engl. 48. Brown and White. Enrollment in this class constitutes membership on the editorial staff of the semi-weekly paper. All composition work is for publication. By faculty action this course may be elected each semester for credit in addition to other courses on a student's roster. No prerequisites. Fee, $1.00. Both semesters (1).

Engl. 49. Brown and White. Enrollment in this class constitutes membership on the business staff of the semi-weekly paper. By faculty action this course may be elected each semester for credit in addition to other courses on a student's roster. No prerequisites. Fee, $1.00. Both semesters (1).

Engl. 50. Editorial Writing. The content and technique of the editorial. Considerable discussion of sociological problems as subjects of editorials. A study of the editorial pages and policies of leading American newspapers. Prerequisites: Engl. 43 and 44. First semester (3).

Engl. 51. Newspaper Problems and Policies. A sudy of the ethical principles of newspaper publishing: "To print or not

to print". Sensational or "yellow" journalism. Evaluation of the policies of leading American newspapers. The organization of a newspaper editorial staff and the duties of the various officers. Prerequisites: Engl. 43 and 44. Second semester (3).

Engl. 52. Sport Writing. How to report and write sporting news, including football, baseball, basketball, polo, track, soccer, lacrosse, wrestling, boxing, tennis, horse and yacht racing, billiards, marksmanship, and golf. Prerequisites: Engl. 43 and 44. Fee, $1.50. First semester (3).

Engl. 53. History of American Journalism. The development of the American newspaper from colonial days to the present; the currents of thought and influence in the journalistic world; the contributions of outstanding figures in American journalism from Peter Zenger to William Randolph Hearst. Prerequisites: Engl. 43 and 44. Second semester (3).

FINE ARTS

ASSISTANT PROFESSOR HOWLAND

F.A. 1. History and Appreciation of the Fine Arts. Presentation of elementary principles that will enable the beginner to attain some knowledge and enjoyment of the fine arts; the historical development of art traced through the ancient and mediaeval periods. Lectures. First semester (3).

F.A. 2. History of the Fine Arts. Continuation of F.A. 1. The art of the Renaissance and present day. Second semester (3).

F.A. 3. History of Architecture. Lectures covering the development of architecture from its beginnings in Egypt and Mesopotamia, through Greece and Rome to the Early Christian period, touching upon the building of the Orient. First semester (3).

F.A. 4. History of Architecture. Continuation of F.A. 3. Romanesque and Gothic architecture, the Renaissance, and developments down to present day building. Second semester (3).

F.A. 5. Freehand Drawing. Elementary freehand perspective, followed by drawing from still life objects in pencil, char-

coal, and in the various modes: delineation, form-drawing, color-value. First semester (3).

F.A. 6. Freehand Drawing. Further practice in expression; color theory with simple exercises in water color. Second semester (3).

F.A. 17. Criticism and Analysis of Art. An advanced course primarily for majors. Readings, investigations, reports, conferences in regard to the works of writers on art with special reference to painting, particularly from the following men: Aristotle, Leonardo da Vinci, Cennino Cennini, Joshua Reynolds, Tolstoi, Lessing, Taine, Goethe, Ruskin, Whistler, Cox, Baldwin Brown, Cortissoz, John LaFarge, Clive Bell, Berenson, Osvald Siren, Phillips, Nordau. The attempt will be made to formulate the theories of art upon which the criticisms are based as well as a study of the paintings themselves in the light of these comments. There will also be an effort to distinguish the differing aims of the chief schools of art, with a chronological study of the changes which have taken place in the attitude both of artist and of the public. This will be followed as time and the aptitude of the students permit by an analytical study of paintings from the compositional and interpretive points of view. Prerequisite: F.A. 1 and 2 or the ability to satisfy the instructor of one's suitable preparation in the history of fine arts. Prospective students should consult the instructor before enrolling. First semester (3).

F.A. 18. Criticism and Analysis of Art. Continuation of F.A. 17. Second semester (3).

GEOLOGY

PROFESSOR B. L. MILLER

ASSISTANT PROFESSORS TURNER AND FRETZ, MR. ROGERS

Geol. 1. Mineralogy. The principles of crystallography with practice in determination of forms of models and crystals; the physical properties, origin, occurrence, association, and alteration of minerals; a study of about two hundred of the common mineral species and varieties, with practice in identification based on physical and chemical properties. Student should

have had Chem. 1 and 11, or 3 and 13. Fee, $5.00. First semester (4).

Geol. 1a. Mineralogy. Similar to Geol. 1, except abbreviated. Fee, $5.00. First semester (3).

Geol. 2. Blowpipe Analysis. A course in qualitative blowpipe analysis in which the chemical and physical behavior of the common chemical elements and their compounds is noted; methods of rapid qualitative tests for the identification of minerals and chemical compounds with the aid of the blowpipe. Student should have had Chem. 1 and 11, or 3 and 13, and 20. Fee, $2.00. First semester (1).

Geol. 3. Introduction to Geology. A study of geologic processes designed to furnish an introductory survey of the subject of geology. Text-book and lectures. Concurrent with Geol. 6. First semester (2).

Geol. 4. General Geology. A course in dynamic, structural, and historical geology. Text-book, supplemented by illustrated lectures in which the relation of geology to economic problems is discussed. Second semester (2).

Geol. 5. Petrology. Microscopic study of igneous, sedimentary, and metamorphic rocks; their origin, classification and identification. Concurrent with Geol. 4. Prerequisite: Geol. 1 or 1a. Second semester (1).

Geol. 6. Geological Field Trips. The region affords excellent examples of varied structures and contains numerous quarries and mines where slate, cement rock, limestone, sandstone, gneiss, serpentine, iron, and zinc are or have been obtained, and gravel, sand, and clay pits. When weather conditions prevent out-door work, in-door laboratory exercises are substituted. Concurrent with Geol. 3 and 4. Fee, $1.00. First and second semesters (1).

Geol. 7. Non-Metallic Economic Geology. A study of the origin, modes of occurrence, properties, sources, production, and uses of non-metallic mineral products. The major portion of the course is devoted to coal and petroleum. Prerequisites: Geol. 1, 3 or 4, 5, and 6. First semester (2).

Geol. 8. Historical Geology. A study of the development of the continents and life forms. A discussion of evolution based on the remains of animal and plant life preserved in the rocks. Text-book, lectures, and laboratory exercises. Prerequisite: Geol. 3 or 4. Second semester (3).

Geol. 16. Physiography. A study of the origin, history, and economic significance of topographic features, soils, and natural resources. When weather permits a field trip is taken each week; laboratory work devoted to instruction and practice in the interpretation and construction of topographic maps is substituted in inclement weather. First semester (3).

Geol. 17. Physiography, Continued. Meteorology, climatology, oceanography, and geographical location are considered separately. This is followed by a consideration of these and other factors constituting the natural environment, in their effect upon man. Laboratory and field exercises. Prerequisite: Geol. 16, 3 or 4. Second semester (3).

Geol. 18. Meteorology and Climatology. A study of the atmosphere and its work followed by investigations of climate. One laboratory period each week is devoted to meteorological instruments, preparation and interpretation of weather maps and other meteorological data, and making forecasts. Second semester (3).

For Advanced Undergraduates and Graduates

Geol. 108. Metallic Economic Geology. A study of the geological occurrence, distribution, uses, and commercial production of the metalliferous minerals; consideration of the most important mining districts. Recitations, illustrated lectures, field trips, and laboratory examination of ore specimens from representative districts of North and South America; visits to the zinc mines of Franklin Furnace, N. J., and Friedensville, Pa., the magnetite mines of Dover, N. J., and Cornwall, Pa., and the anthracite coal regions. Prerequisites: Geol. 1, 3 or 4, and 5. Second semester (3).

Geol. 109. Paleontology. An elementary course in which the plant and animal life of the past is considered from both the biological and geological viewpoint; theories of the origin

and evolution of life; principles of stratigraphy and paleontology; study in the laboratory of index fossils of the successive geologic periods. Prerequisite: Geol. 3 or 4. Second semester (3).

Geol. 110. Stratigraphic Geology. The geological age and geographical distribution of the rocks of the North American continent; the structure and history of its mountain ranges; the history of its geological development. For those who have not already had Geol. 8 or 109, a few weeks are devoted to a study of evolution and characteristic fossil forms. Prerequisite: Geol. 3 or 4. Second semester (2).

Geol 111. Field Geology. Practice in the actual mapping of surface geology, each student being assigned a definite area and required to prepare a report on the assigned area accompanied by a geological map with structure sections; collection by each student of a full set of specimens to illustrate the geology. The first part of the course devoted exclusively to field work; the notes and specimens studied in the laboratory when the weather prevents further out-door work. Prerequisites: Geol. 3 or 4, 5, and 6. Fee, $1.00. First semester (2).

Geol. 112. Petrography. The optical properties of minerals and their study with the petrographic microscope; petrography of the most important igneous rocks. Lectures, recitations, and laboratory work. Prerequisites: Geol. 1 and 5. Fee, $3.00. First semester (2).

Geol. 114. Structural Geology. The study of special features of structural geology in the field and laboratory. Prerequisites: Geol. 3 or 4, and 6. First semester (1).

Geol. 115. Geologic Methods. Methods used by the United States Geological Survey and by the mining companies that employ geologists; special attention to the problems that confront an economic geologist in the investigation of coal lands, oil properties, metal mines, etc. Prerequisite: Geol. 111. First or second semester (1).

Geol. 116. Geology Seminar. Investigations of current and classic geological literature. Assigned readings and reports. Participated in by members of the teaching staff and advanced students. First and second semesters (1).

For Graduates

Geol. 220. Geological Investigation. The investigation and study of the literature of some special geological problem. Field and laboratory work on some district; map of a limited area; an investigation of the microscopic character and general structural features of the rocks which are exposed; presentation of a thesis or dissertation embodying these results. Preparation required dependent upon the nature of the problems to be studied. Prospective students for this course should first consult the professor in charge. First semester (4). Professor Miller.

Geol. 221. Geological Investigation. Continuation of Geol. 220. Second semester (4). Professor Miller.

Geol. 222. Advanced Economic Geology. Advanced work in ore deposits. Study of the literature and of the theories of ore deposition, together with detailed work on the type occurrences of some of the metallic or non-metallic minerals; thorough investigation and report on some mining district with special regard to the origin of the ores and such commercial aspects of the deposits as may depend chiefly on the geology: preparation and microscopic study of specimens of ores. Prerequisites: Geol. 7 and 108. First semester (3) to (6). Professor Miller.

Geol. 223. Advanced Economic Geology. Continuation of Geol. 222. Second semester (3) to (6). Professor Miller.

Geol. 224. Advanced Petrography. A critical study of recent advances in petrographic methods and nomenclature; preparation of detailed report on a selected problem. Prerequisites: Geol. 1, 3 or 4, 5, and 112. Second semester (3). Assistant Professor Turner.

Geol. 225. Advanced Physiography. The detailed study of physiographic types and processes. Conferences, reports, and thesis, with work in the laboratory and field. Prerequisite: training in elementary physiography and general geology. First semester (4). Professor Miller.

Geol. 226. Advanced Physiography. Continuation of Geol. 225. Second semester (4). Professor Miller.

Geol. 227. Physical Crystallography. An advanced course in the geometrical and physical properties of crystals with special reference to the Goldschmidt method of crystal measurement and projection. Prerequisites: Geol. 1, Phys. 6 and 7. First semester (2). Assistant Professor Fretz.

Geol. 228. Crystallographic Structure. An advanced course in the molecular and atomic structure of metals and crystalline mineral salts and the point group system of space lattices. Assigned reading of the recent literature on the subject. Prerequisite: Geol. 1. First semester (1) or (2). Assistant Professor Fretz.

Geol. 229. Coal Research. A study of the constitution of coal, embracing a review of the literature and the preparation and microscopical examination of thin sections and polished surfaces. First or second semester (3). Assistant Professor Turner.

Geol. 230. Coal Research. Continuation of Geol. 229. First or second semester (3). Assistant Professor Turner.

GERMAN

PROFESSOR PALMER,
ASSOCIATE PROFESSOR MORE, ASSISTANT PROFESSOR KEGEL,
MR. HARTZELL

Ger. 1. Elementary German. First semester (3).

Ger. 2. Elementary German. Continuation of Ger. 1. Prerequisite: Ger. 1 or the equivalent. Second semester (3).

Ger. 3. Intermediate German. German prose and poetry. Heine, Keller, C. F. Meyer, Storm, Heyse. Outside reading. Composition. Prerequisite: Ger. 2 or the equivalent. First semester (3).

Ger. 4. Intermediate German. Continuation of Ger. 3. Prerequisite: Ger. 3 or the equivalent. Second semester (3).

Ger. 7. German of Chemistry. Rapid reading of selected texts on Chemistry. Prerequisite: Ger. 2 or the equivalent. First semester (3).

Ger. 9. Advanced German, Prose and Poetry. Rapid reading of representative texts; collateral reading. Prerequisite: Ger. 4 or 6. First semester (3).

Ger. 10. Goethe's Faust. Study of Part 1. Lectures on the origin and development of the Faust story; collateral reading. Prerequisite: Ger. 3 or 4, or the equivalent. Second semester (3).

Ger. 21. Methods in German. A course for prospective teachers. Advanced German grammar, German composition, conversation, methods of teaching, and discussion of textbooks. Prerequisite: Ger. 10 or the equivalent. Second semester (3).

For Advanced Undergraduates and Graduates

Ger. 111. Nineteenth Century German Drama. Lectures, reading, reports on assigned work. Prerequisite: Ger. 10 or the equivalent. First semester (3).

Ger. 112. Nineteenth Century German Drama. Continuation of Ger. 111. Second semester (3).

Ger. 113. Lessing, Goethe, and Schiller. Prerequisite: Ger. 10 or the equivalent. First semester (3).

Ger. 114. Lessing, Goethe, and Schiller. Continuation of Ger. 113. Second semester (3).

Ger. 115. The German Short Story. Origin and development. Rapid reading of illustrative stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse; lectures and reports. Prerequisite: Ger. 10 or the equivalent. First semester (3).

Ger. 116. The German Short Story. Continuation of Ger. 115. Second semester (3).

GOVERNMENT

See History and Government

GREEK

PROFESSOR GOODWIN

Gk. 1. Elementary Greek. For freshmen and sophomores who have entered without Greek, but who desire to take up the study in college. They perform in two years approximately the amount of work required for admission from those

who present Greek, and are prepared to proceed in the third year with Gk. 5. The introductory book and a small portion of the *Anabasis* are studied in the first two semesters. This course will be given only in years when at least six applications are received. Prerequisite: None, but some knowledge of Latin is highly desirable. First semester (3).

Gk. 2. Elementary Greek. Continuation of Gk. 1. Second semester (3).

Gk. 3. Second-Year Greek. *Anabasis* continued; *Iliad* (if time permits); grammar and simple composition. Offered only when Gk. 1 and 2 have been given in the preceding year. Prerequisites: Gk. 1 and 2, or one year of entrance Greek. First semester (3).

Gk. 4. Second-Year Greek. Continuation of Gk. 3. Second semester (3).

Gk. 5. Attic Prose. Lysias, selected *Orations*, Xenophon, *Memorabilia*, or some other work. Review of the grammar; composition and other exercises; careful study of Attic prose syntax; special attention given to the formation of correct methods of study and translation, to grammatical analysis, and to the reading aloud of Greek. Available time is employed in sight-reading. Herodotus. One book begun. Prerequisites: Gk. 1, 2, 3, and 4, or entrance Greek. First semester (3).

Gk. 6. Herodotus and Plato. Herodotus continued. Study of the forms and syntax of the Ionic dialect. Plato. *Euthyphro*, *Apology*, or other shorter dialogues. Grammar and composition as in the first semester. Prerequisite: Gk. 5. Second semester (3).

Gk. 7. Thucydides. One or more books. Composition. Prerequisites: Gk. 5 and 6. First semester (3).

Gk. 8. Tragedy. Euripides. *Medea*, *Bacchae*, or another play. Sophocles. *Oedipus Tyrannus*, *Antigone*, or another. Literary study of the drama; poetical language, style, and conception; metrical reading; composition. Prerequisites: Gk. 5 and 6. Second semester (3).

Gk. 9. Dramatic Poetry (continued). Aeschylus, *Agamemnon* or *Prometheus Bound*. Aristophanes. *Clouds*, *Frogs*, or

Birds. Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized. Metres. Elementary text-criticism. Prerequisites: Gk. 5, 6, and 8. First semester (3).

Gk. 10. Greek Oratory. Jebb's *Selections from the Attic Orators*. Demosthenes. Selected orations. Rapid reading, the student being supposed to have reasonable facility in understanding the Greek directly without rendering into English. Attention is directed largely to those points which illustrate the development of Greek prose style. Prerequisites: Gk. 5 and 6. Second semester (3).

Gk. 11. Homer. Rapid reading of considerable portions of the *Iliad* or *Odyssey*. Homeric language, syntax, and metre reviewed, with some reference to the needs of intending teachers, but chiefly as a foundation for the study outlined in Gk. 12. Prerequisites: Gk. 5 and 6. First semester (3).

Gk. 12. Lyric Poetry. Fragments of the Elegiac, Iambic, and Melic poets; selections from Pindar or Theocritus. Prerequisites: Gk. 5, 6, and 11. Second semester (3).

Gk. 13. Hellenistic Greek. *New Testament*. Selections from Lucian. To be substituted on occasion for Gk. 12. Prerequisites: Gk. 5 and 6, and the approval of the professor. Second semester (3).

Courses Gk. 9 and 11, 10 and 12 (or 13) are offered in alternate years, and are open to both juniors and seniors.

Gk. 31. Greek History. Lectures, text-book, and readings. For seniors and juniors. Not given in 1929-1930. Second semester (3).

Candidates for honors in Greek will be assigned special readings on request.

For Graduates

Candidates must satisfy the Professor of Greek as to their adequate preparation for the following courses. Ordinarily at least four years of Greek in college will be expected as a prerequisite.

Gk. 201. Greek Poetry. The development of poetry in Greece from Homer to the Drama, with special study of the

Lyric Poets, and collateral reading. First semester (3). Professor Goodwin.

Gk. 202. GREEK POETRY. Continuation of Gk. 201. Second semester (3). Professor Goodwin.

Gk. 203. GREEK PHILOSOPHY. The history of philosophic thought in Greece, particularly in the Pre-Socratic period. Ritter and Preller's *Historia Philosophiae Graecae*, and collateral reading. First semester (3). Professor Goodwin.

Gk. 204. GREEK PHILOSOPHY. Continuation of Gk. 203. Second semester (3). Professor Goodwin.

Gk. 205. HELLENISTIC GREEK. Portions of the *Gospels* in a comparative study, the *Acts*, and selected *Epistles*. Chapters from the *Septuagint*. Patristic literature. Collateral reading. Selections from Lucian. First semester (3). Professor Goodwin.

Gk. 206. HELLENISTIC GREEK. Continuation of Gk. 205. Second semester (3). Professor Goodwin.

HISTORY AND GOVERNMENT

PROFESSOR GIPSON, ASSOCIATE PROFESSOR S. M. BROWN,*
ASSISTANT PROFESSORS HARMON, SCHULZ, AND MACDONALD

HISTORY

Hist. 7. HISTORY OF ENGLAND TO 1603. A study of Early Britain, the Anglo-Saxon Heptarchy and customs, the Norman Conquest, development of Parliament, continental wars, and the War of the Roses. Not given in 1930-1931. First semester (3).

Hist. 8. HISTORY OF ENGLAND TO 1603, CONTINUED. The Tudor Dynasty; the breaking-up of the mediæval economy, the Reformation, rise of the middle class, mercantilism, and the era of exploration. Prerequisite: Hist. 7. Not given in 1930-1931. Second semester (3).

Hist. 9. HISTORY OF ENGLAND, 1603-1925. The Stuarts and the Protectorate; the new social conditions; conflict between king and Parliament; the Puritan Revolution; Cromwell and the Protectorate. To alternate with Hist. 7. First semester (3).

* Absent on leave, 1929-1930.

Hist. 10. History of England, 1603-1925, Continued. Continental policy in the eighteenth century; the coming of Empire; the industrial revolution; political appearance of the cabinet; colonial expansion. Prerequisite: Hist. 9 or by permission. To alternate with Hist. 8. Second semester (3).

Hist. 11. American Colonial History. The period of discovery and exploration; rival settlements in North America by Spain, France, England, and Holland; the English colonial proprietors and the colonial charters; the growth of representative government; the beginnings of constitutional controversy. Not given in 1930-1931. First semester (3).

Hist. 12. American Colonial History. The establishment of parliamentary trade restrictions; colonial immigration, trade, and finance; western expansion and the collapse of the French empire in America; the new colonial system and its breakdown; the war for Independence. Not given in 1930-1931. Second semester (3).

Hist. 13. United States History. The era of constitution making; the evolution of political parties; foreign relations during the wars of the French revolutionary period; the western movement and western state-building; the growth of sectionalism. First semester (3).

Hist. 14. United States History. The war for the Union; the reconstruction of the South; the era of big industry and labor combinations; the United States as a world power; the new national paternalism. Second semester (3).

Hist. 22. Queen Elizabeth and Her Contemporaries. A study of the great personalities of this period. Second semester (3).

Hist. 25. European History. A rapid survey of the major historic forces from the collapse of the Roman Empire to the era of Louis XIV. Emphasis placed upon the cultural aspects of mediæval society. First semester (3).

Hist. 26. European History. Continuation of Hist. 25. A more detailed account of historic developments in the eighteenth and nineteenth centuries with an attempt to set forth the more important political antecedents of the World War. Second semester (3).

Hist. 27. European Expansion and Empire Building, 1492-1820. This course consists of a study of certain aspects of the phenomenon of the spread of European civilization and empire into the continents of America, Asia, and Africa. The following topics are emphasized: the progress of discovery, exploration, and settlement; European relations with the native peoples; the evolving of the imperial systems in the sixteenth and seventeenth centuries; imperial rivalries of the eighteenth century; the disintegration of the old empires of of France, Spain, and England in the eighteenth and nineteenth centuries. First semester (3).

Hist. 28. European Expansion and Empire Building, 1492-1820. Continuation of Hist. 27. Second semester (3).

Attention is called also to the following courses in History offered by other departments: Ancient History by the Department of Latin; Economic History by the Department of Economics and Business Administration; Greek History by the Department of Greek.

For Advanced Undergraduates and Graduates

Hist. 103. Ecclesiastical History. The Formative Period. Conditions in the Roman Empire; the Apostolic Age; the period of heresies; the Ante-Nicene Fathers: Arius, Athanasius, and the Sabellians. The Council of Nicæa. Prerequisites: Hist. 25 and 26, or by permission. First semester (3).

Hist. 104. Ecclesiastical History. The Period of Growth. The rise of the Papacy; monasticism; Imperium and Sacerdotium; growth of Canon Law; the twelfth century heresies; the Reformation; Council of Trent; subsequent changes. Prerequisite: Hist. 103 or by permission. Second semester (3).

Hist. 115. The Renaissance. The decline of mediævalism; revived study of the humanities; influence on literature, art. religion, and society. A seminar course; admission by permission only. Not given in 1930-1931. First semester (3).

Hist. 116. The Reformation. Continuation of Hist. 115. The revolt within the church; its spread to Germany; Luther; Melancthon; Calvin; the sixteenth century commercial revolution; nationalist tendencies. Prerequisite: Hist. 115. Not given in 1930-1931. Second semester (3).

Hist. 117. The French Revolution. The precursors of the Revolution: Quesnay and the Physiocrats, the "Intellectuals," Montesquieu, Voltaire, Rousseau; social and financial chaos. A seminar course. Admission by permission only. First semester (3).

Hist. 118. The French Revolution. Continuation of Hist. 117. The Revolution: political and constitutional changes; the spirit of the Jacobins; the Reign of Terror; reactions within France and beyond the Rhine; the submersion of the Republic in the Empire. Second semester (3).

Hist. 119. Seminar. Open to students of senior standing who desire to major in history or who have shown ability in the field of humanistic studies. A brief period of history studied intensively. Subject for 1930-1931: "The British Empire and the American Revolution." First semester (3).

Hist. 120. Seminar. Continuation of Hist. 119. Second semester (3).

Hist. 123. England under the Stuarts. A course designed to give a general view of the constitutional and political development of the seventeenth century; a survey of social England. Summer session (3).

Hist. 129. American Foreign Policy. The French alliance; independence and boundaries; commercial restrictions; French Revolution and neutrality; purchase of Louisiana; War of 1812; acquisition of Florida; Monroe Doctrine; relations with France and Great Britain; Oregon and Texas; the Mexican War; manifest destiny; Isthmian diplomacy; China and Japan. Not given in 1930-1931. First semester (3).

Hist. 130. American Foreign Policy. Civil War and possible European intervention; Alaska boundary; War with Spain; the new Caribbean policies; the World War; the League of Nations; Washington Conference; the aftermath of the Great War. Not given in 1930-1931. Second semester (3).

Hist. 139. The Civil War. Background of the Civil War; Buchanan's policy; Lincoln's attitude; views of Davis; Northern and Southern leaders contrasted. First semester (3).

Hist. 140. Reconstruction of the Union. Problems of a restored Union; the policy of Johnson; views of the North and South; radical reconstruction; the election of Grant; the Supreme Court and reconstruction; the restoration of white supremacy in the South. Second semester (3).

Hist. 175. Leading Figures in European History. A series of biographical studies, treating of men and women in church and state from Charlemagne to Napoleon. Emphasis cultural rather than purely historical. Summer session (3).

For Graduates

Students desiring to major in History and Government should have had at least two courses throughout the year in connection with their undergraduate work that bear upon this field of study or in other ways should satisfy the Department that they are in a position to undertake profitably the required program for the master's degree. Students should register for graduate work only after consultation with the Head of the Department.

Hist. 201. English Institutional History. A study of political, social, economic, and religious institutions which have most profoundly influenced American civilization. Not given in 1930-1931. First semester (3). Professor Gipson.

Hist. 202. English Institutional History. Continuation of Hist. 201. Not given in 1930-1931. Second semester (3). Professor Gipson.

Hist. 211. English Colonization in North America in the Seventeenth Century. The activities of the great overseas trading companies; the problem of proprietorial control; the decline of the chartered colonies; conflicts between opposing political, economic, and religious ideals within the colonies. Not given in 1930-1931. First semester (3). Professor Gipson.

Hist. 212. English Colonization in North America in the Seventeenth Century. Continuation of Hist. 211. Not given in 1930-1931. Second semester (3). Professor Gipson.

Hist. 213. America in the Eighteenth Century. The workings of the English mercantile system; the evolution of colonial institutions; the international struggle for the fur trade in

North America; George III and the new administrative system. Not given in 1930-1931. First semester (3). Professor Gipson.

Hist. 214. America in the Eighteenth Century. Continuation of Hist. 213. Not given in 1930-1931. Second semester (3). Professor Gipson.

Hist. 215. American Constitutional History. The major problems involved in the growth of the powers of the national government. First semester (3). Professor Gipson.

Hist. 216. American Constitutional History. Continuation of Hist. 215. Second semester (3). Professor Gipson.

Hist. 217. America as a World Power. The relations of the United States with Latin America; the problem of the Pacific; the United States and Europe. Not given in 1930-1931. First semester (3). Professor Gipson.

Hist. 218. America as a World Power. Continuation of Hist. 217. Not given in 1930-1931. Second semester (3). Professor Gipson.

Hist. 225. Pennsylvania History. In this course various aspects of eighteenth century Pennsylvania history are studied such as the evolution of the institutions of government, the relations of the settlers to the proprietors, the land policy, the Indian policy, the relations of the various racial groups and religious groups toward one another and toward the provincial government, the relations of Pennsylvania and her colonial neighbors. First semester (3). Professor Gipson.

Hist. 226. Pennsylvania History. Continuation of Hist. 225. Second semester (3). Professor Gipson.

GOVERNMENT

Govt. 51. American Government (National). The evolution of the constitution; distribution of powers between the national government and the states; citizenship; nomination, election, and powers of the President; the machinery of legislation; the courts and the constitution. First semester (3).

Govt. 52. American Government (State). The position of the states in the union; state constitutions; the executive,

legislative, and judicial branches of state government; current criticisms and suggested reforms; instruments of popular control; the various forms of local government. Second semester (3).

Attention is also called to the courses in Roman Law and Roman Political Institutions offered by the Department of Latin.

For Advanced Undergraduates and Graduates

Govt. 156. International Law. Consideration of the rules governing the conduct of States in their relations with one another in time of peace and during war. Second semester (3).

Govt. 157. Problems of Municipal Management. A study of the various factors involved in the efficient conduct of city government. Special emphasis given to the working of the city manager type of government. First semester (3).

Govt. 158. Problems of Municipal Management. Examination of the fundamental principles of effective administration; a survey of such municipal problems as city planning, health control, urban transportation, police and fire protection, water supply, and waste collection and disposal. Second semester (3).

Govt. 159. Political Concepts and Principles. Analysis of the basic concepts of political science: state, government, sovereignty, law, liberty, rights; consideration of the various types of governmental organization and the nature of the legislative, executive, and judicial functions. First semester (3).

Govt. 171. The Foundation of Mediaeval Theory. The Greek and Roman contribution; the political theory of the Old and New Testaments; the writings of the Church Fathers to and including Augustine. First semester (3).

Govt. 172. The Political Theory of the Middle Ages. The concordance of the Christian and Teutonic approaches to politics. A study of the leading theorists and political movements from the fifth to the fifteenth centuries. Second semester (3).

Govt. 173. Political Thought in Modern Times. A survey of the political thought of Machiavelli, Luther, Calvin, Althusius, Bodin, Grotius, Hobbes, Locke, Montesquieu, Rous-

seau, and others down to the nineteenth century; consideration of the social contract, natural law, inalienable rights, and popular sovereignty theories. Open to juniors and seniors by permission. Not given in 1930-1931. First semester (3).

Govt. 174. Political Thought in Modern Times. A continuation of Govt. 173 bringing the history of political thought down to the present day. Examination of the political thought and ideas of groups such as the Socialists, Communists, Syndicalists, and Bolshevists. Not given in 1930-1931. Second semester (3).

ITALIAN

See Romance Languages

JOURNALISM

See English

LATIN

PROFESSOR WRIGHT,

ASSOCIATE PROFESSOR E. L. CRUM, MR. R. H. CRUM

Lat. 1a. For freshmen who enter with four years of high-school Latin. Pliny. Selected letters. Martial. Selected epigrams. Vergil. *Bucolics*. Some study of Roman life under the Empire. The history and development of the epigram and of pastoral poetry; the influence of Latin poetry upon English literature emphasized. First semester (3).

Lat. 1b. For freshmen who elect the course after three years of high-school Latin. Vergil. *Bucolics* and the *Aeneid* I-VI, or selections from Ovid. Practice in reading aloud and scansion; training in sight translation; some study of the mythology and religion of Greece and Rome; the influence of Latin poetry upon English literature emphasized. First semester (3).

Lat. 2. Horace. Selected *Odes*. Lectures on the history and development of lyric poetry; constant practice in reading the more important lyric metres; memorizing of stanzas and passages from Horace. Second semester (3).

Lat. 4. Livy. Selections from the earlier books. Some study of early Roman history and topography. Cicero. Selected letters. Prerequisites: Lat. 1 and 2. First or second semester (3).

Lat. 10. The Teaching of High School Latin. Discussion of aims, content, and methods, and of the standard texts used in preparatory school Latin, with a consideration of the report of The Classical Investigation, of Lodge's *Vocabulary of High School Latin*, and of Byrne's *Syntax of High School Latin*. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 3 and 4. First semester (3).

Lat. 11. English Words Derived from the Latin. A course intended to give the student some familiarity with those Latin words that have contributed most largely in derivatives to the English language and to teach the intelligent use of the English dictionary. Elective for all students; no previous knowledge of Latin required. First semester (3).

Lat. 13. Latin Drama. A study of drama among the Romans; native dramatic performances; indebtedness to Greek drama; the various dramatic forms and their vogue; chief writers; dramatic festivals; the Roman theatre; influences in later literature. Reading of selected plays of Plautus, Terence, and Seneca. Prerequisites: Lat. 1 and 2. First or second semester (3).

Lat. 21. Ancient History. A survey of the development of civilization from Paleolithic times to the world empire of Alexander the Great. The first six weeks are assigned to the Stone Ages, the Oriental nations, and the Minoan Civilization; the remainder of the semester to Hellenic Greece. In conjunction with an outline of political history, the social, economic, religious, philosophic, artistic, and literary development of the world is stressed, as well as the origin of political institutions. First semester (3).

Lat. 22 Ancient History. Continuation of Lat. 21. The Hellenistic Age. Rome from her origin to 395 A.D. Second semester (3).

Lat. 23. Roman Law. Preliminary lectures on laws and customs of peoples anterior to the rise of Roman law. A study of the development of Roman law from the *Leges Regiae* to the codification by Justinian. Readings and discussions of select portions of the law comparing them with modern law. Some time is given to the influence of Roman law on modern

nations. Open to sophomores, juniors, and seniors. Second semester (3).

Lat. 24. Roman Political Institutions. A course dealing with the political institutions established and developed at Rome from the earliest times down to the reign of Diocletian. A descriptive and historical survey of political life at Rome and in its provinces by means of lectures, assigned readings, and special reports. Some consideration of titles and the duties of the State officials during the regal period, the republic, and the empire. Open to sophomores, juniors, and seniors. First semester (3).

Lat. 31. Beginning Latin. Special emphasis on English derivatives and the principles of grammar. First semester (3).

Lat. 32. Caesar. *The Gallic War.* Books I-IV. Prose composition and syntax. Second semester (3).

Lat. 33. Caesar. One or two of the later books of the *Gallic War* or selections from the *Civil War.* Cicero. Orations. Prose composition and syntax, with special emphasis on clause construction. A course designed for students who enter with two years of high school Latin and who elect to continue their Latin rather than take Lat. 21. First semester (3).

Lat. 34. Cicero. Continuation of Lat. 33. Orations: *de Senectute* or *de Amicitia.* Second semester (3).

For Advanced Undergraduates and Graduates

Lat. 105. Satire. Selected satires of Horace and Juvenal. Lectures on the history of Roman satire and its influence on modern literature. Study of social conditions under the Empire. Prerequisites: Lat. 3 and 4. First semester (3).

Lat. 106. Roman Prose Writers of the Empire. Selections from the following: Petronius, *Cena Trimalchionis;* Apuleius, Cupid and Psyche story from the *Metamorphoses;* Suetonius, *Lives;* Seneca, *Moral Epistles* and *Dialogues;* Tacitus, *Germania.* Prerequisites: Lat. 3 and 4. Second semester (3).

Lat. 107. Vergil. *Aeneid,* Books VII-XII. Continuation of Lat. 108. Second semester (3).

Lat. 108. Lucretius. The finest literary passages and selected passages illustrating his philosophy. Ennius and some

study of early Roman epic. Vergil's sixth *Aeneid*. An intensive study of its debt to Greek literature, religion, and philosophy, and its influence on modern literature. Lectures on the history of the epic; collateral reading in the great epics of other literatures. Prerequisites: Lat. 3 and 4. First semester (3).

Lat. 109. Latin Prose Composition. Exercises in translating from English into Latin, with a collateral study of Latin grammar. Special attention to clause construction and other points of syntax. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 3 and 4. First semester (3).

MATHEMATICS AND ASTRONOMY

PROFESSORS FORT, OGBURN, REYNOLDS, AND SMAIL,
ASSOCIATE PROFESSOR STOCKER,
ASSISTANT PROFESSORS WEIDA. LAMSON, AND TRJITZINSKY,
MESSRS. BARNES, HAMMATT, KEELER, KICHLINE,
LEWIS, VAN ARNAM, STANLEY, AND ILLICK

The major in mathematics in the College of Arts and Science consists in all of at least twenty-four semester hours college credit in mathematics. It must include Math. 1, 2, (or 1a, 2a,) 3, 4, and 16, except that a student who has entrance credit in plane trigonometry does not take Math 1, a student who has entrance credit in advanced algebra does not take Math. 2, and a student who has entrance credit in solid geometry does not take Math. 16. The twelve hours advanced credit required by the regulations of the College must be from mathematics courses given at Lehigh University other than Math. 15, 16, 1, 2, 3, and 4.

The major in mathematics and astronomy consists of at least twenty-four semester hours college credit in mathematics and astronomy. It must include Math. 1, 2, 3, and 4 and Astr. 2 and 3, except that students having entrance credit in plane trigonometry or advanced algebra or solid geometry do not take Math. 1 or 2 or 16 as above. The twelve hours advanced credit required shall not include Math. 15, 16, 1, 2, 3, 4 or Astr. 1.

A student entering the freshman class in the College of Engineering normally takes Math. 2. If, however, he presents advanced algebra for entrance credit he enters Math. 3, substi-

tuting for Math. 2 at some time a mathematics course for which he has the prerequisites or some other free elective.

A placement examination is given each year during Freshman Week to all freshmen who present plane trigonometry for entrance. This examination stresses trigonometry but includes some questions on solid geometry. Students who do not make a reasonable showing on this examination are required to take Math. 1 instead of Math. 2.

MATHEMATICS

Math. 1. Plane Trigonometry. Each semester (3).

Math. 1a. Unified Mathematics. This course is designed for incoming freshmen in the College of Arts and Science. Each semester (3).

Math. 2. Algebra. Beginning with the theory of quadratic equations. Prerequisite: Math. 1, or entrance credit in plane trigonometry. Each semester (3).

Math. 2a. Unified Mathematics. Continuation of Math. 1a. Prerequisite Math. 1a. Each semester (3).

Math. 3. Analytic Geometry. The usual elementary course treating among other things the straight line, the conic sections, and some three dimentional geometry. Prerequisite: Math. 2. Each semester (3).

Math. 4. Elements of Calculus. The formal rules of differentiation and of integration with simple applications. Prerequisite: Math. 3. Each semester (3).

Math. 5. Applications of Calculus. Maxima and minima, rates, lengths, areas, and volumes of figures of revolution; double and triple integrals, centers of gravity, moments of inertia, etc. Prerequisite: Math. 4. Each semester (3).

Math. 6. Advanced Calculus. Theorem of the Mean, Taylor's Theorem, manipulation of power series, etc.; elementary differential equations. Prerequisite: Math. 5. Each semester (3).

Math. 15. Reading Course in Mathematics. Credit not to exceed one hour per semester, total credit not to exceed three hours, approval of program and written report required.

Math. 16. Solid and Spherical Geometry and Spherical Trigonometry. Open to all students, particularly advised for students of astronomy. Each semester (3).

Math. 20. Elementary Mechanics. Composition and resolution of forces, conditions of equilibrium for rigid bodies, friction, work, elementary kinematics and kinetics. Each semester (4).

Math. 21. Analytic Mechanics. Differential equations of motion, treatment of forces in space, free and constrained motion of a particle and of masses, with applications to practical problems. Prerequisites: Math. 5 and 6. Each semester (3).

Math. 41. Mathematics of Finance. Annuities, sinking funds, amortization, etc., life insurance. Prerequisite: Math. 2. First semester (3).

Math. 42. Mathematical Statistics. Prerequisite: Math. 2. Second semester (3).

Math. 43. First Course in Mathematics of Life Insurance. Mathematical theory of life contingency; preparation of life and monetary tables; computation of premiums for various life insurance policies; valuation of policies to meet statutory requirements; mathematical theory of risk and cost of insurance; computation of items for annual reports; valuation of life annuities; computation of periodic premium for various life annuities. Prerequisite: Math. 41. First semester (3).

Math. 51. Advanced Algebra. Complex numbers, theory of equations with applications to classical problems, Sturm's theorem, etc., determinants and the theory of resultants. Prerequisite: Math. 2. One semester (3).

Math. 52. Projective Geometry. Fundamental ideas and theorems of this great geometric method. Prerequisite: Math. 3. One semester (3).

Math. 53. Second Course in Analytic Geometry. More complete treatment of conic sections and higher plane curves than is possible in Math. 3. Additional work on solid analytic geometry. One semester (3).

Math. 54. History of Elementary Mathematics. Prerequisite: Math. 2. One semester (3).

For Advanced Undergraduates and Graduates

Math. 111. Advanced Differential Equations. Special solvable nonlinear equations, linear equations, transformations and symbolic methods, solutions in series, Riccati's, Bessel's, and Legendre's equations, partial differential equations. Prerequisite: Math. 6. First semester (3).

Math. 112. Advanced Differential Equations. Continuation of Math. 111. Fourier series, cylindrical and spherical harmonics. Second semester (3).

Math. 122. Advanced Analytic Mechanics. Prerequisite: Math. 21. First semester (3).

Math. 123. Advanced Analytic Mechanics. Continuation of Math. 122. Second semester (3).

Math. 124. Theory of Errors and Least Squares and Empirical Formulas. Probability and its relation to precision, development of the theory of least squares and its application in the study of errors, the formation of empirical formulas from given or observed data. Designed for students engaged in experimental or observational work. Prerequisite: Math. 6. Second semester (3).

Math. 125. Operational Calculus. The classical method of solution of the differential equations of the type used in the electrical circuit theory; various proofs of the superposition theorem, of the infinite integral theorem, and of the Heaviside expansion theorem; approximate methods; operators, their interpretation and application of a theorem of Borel; applications of the Fourier integral and transforms; fractional-order derivatives; series expansions of operators; Volterra's theorem; asympototic series; Wiener's applications of a generalized Fourier integral to operational calculus; Paul Levy's treatment. The existing gaps in the theory are, whenever possible, remedied or pointed out. Numerous applications to electric circuit problems are stressed throughout the course. Prerequisite: Math. 111. One semester (3).

For Graduates

To major in the Department of Mathematics and Astronomy, and obtain a master's degree in one year, a graduate student must present evidence of having completed the equivalent of the work required in this department of graduates of the Col-

lege of Arts and Science who majored in Mathematics or Mathematics and Astronomy. Graduate students who cannot satisfy these requirements but who desire to major in Mathematics or Mathematics and Astronomy may take preliminary courses for which they are prepared, but cannot expect to complete the requirements for a master's degree in one year.

Math. 200. Fundamental Concepts of Mathematics. (3). Professor Fort.

Math. 201. Vector Analysis. The theory and methods of vector analysis as applied in physics and pure mathematics. Prerequisite: Math. 6. (3). Professor Reynolds or Professor Smail.

Math. 202. Vector Analysis. Continuation of Math. 201. (3). Professor Reynolds or Professor Smail.

Math. 206. Numerical Integration. Theory and practice of numerical methods applied to otherwise intractable problems, with special reference to the solution of differential equations. Prerequisite: Math. 112. (3). Assistant Professor Weida.

Math. 209. Mathematics Seminar. Reports on special topics of the literature and of individual research. Prerequisite: graduate standing and consent of the instructor. (3). Professor Fort or Professor Reynolds or Professor Smail or Assistant Professor Lamson.

Math. 210. Mathematics Seminar. Continuation of Math. 209. (3). Professor Fort or Professor Reynolds or Professor Smail or Assistant Professor Lamson.

Math. 211. Infinite Processes. Fundamental limit notions applied to various infinite processes. (3). Professor Fort or Professor Smail.

Math. 212. Infinite Processes. Continuation of Math. 211. (3). Professor Fort or Professor Smail.

Math. 215. Theory of Functions of a Complex Variable. (3). Professor Fort or Professor Smail.

Math. 216. Theory of Functions of a Complex Variable. Continuation of Math. 215. Prerequisite: Math. 215. (3). Professor Fort or Professor Smail.

Math. 217. Theory of Elasticity. Theory of stress and strain. Tension and thrust with applications. Bending of rods

and plates. Equilibrium of curved rods, cylinders, and spheres. (3). Professor Reynolds.

Math. 218. THEORY OF ELASTICITY. Continuation of Math. 217. (3). Professor Reynolds.

Math. 219. SELECTED TOPICS IN QUANTUM MECHANICS AND RELATIVITY. Newton's equations; Lagrange's equations; Hamilton's equations; Hamilton's partial differential equation; the wave equation of optics; Schrödinger's work, with incidental introduction of characteristic functions of second order ordinary differential equations; the hydrogen atom in the normal state, and perturbed state; the theory of the Stark-effect in the new mechanics; the work of Dirac and others. The relativity part of the course will be of the conventional type. (3). Assistant Professor Lamson.

Math. 220. SELECTED TOPICS IN QUANTUM MECHANICS AND RELATIVITY. Continuation of Math. 219. (3). Assistant Professor Lamson.

ASTRONOMY

Astr. 1. DESCRIPTIVE ASTRONOMY. An elementary illustrated lecture course, open to all students. May not be substituted for Astr. 2. Second semester (3).

Astr. 2. GENERAL ASTRONOMY. Fundamental facts and principles of the subject with solution of problems using calculus; observatory visits. Prerequisite: Math. 4. First semester (3).

Astr. 3. PRACTICAL ASTRONOMY. Instruments used; methods of taking and reducing observations to determine time, latitude, and azimuth; observatory work in which each student makes his own observations and computations in illustration of the problems studied. Prerequisites: Astr. 2 and Math. 5. First semester (3).

For Graduates

Astr. 201. ASTRONOMY SEMINAR. The study of instruments and methods used in the determination of time, latitude, longitude, and azimuth; practical work in the observatory, to give facility in making and reducing observations. Prerequisite: Astr. 3. (3). Professor Ogburn.

Astr. 202. ASTRONOMY SEMINAR. Continuation of Astr. 201. (3). Professor Ogburn.

MECHANICAL ENGINEERING

PROFESSORS F. V. LARKIN, KLEIN, BUTTERFIELD, AND STUART, ASSISTANT PROFESSORS AULT AND JENNINGS, MESSRS. CONNELLY AND THOM

M.E. 1. Elementary Machine Design. A course in the development of the mathematics of machine construction and the practical application of the design of machine elements, such as shafts, keys, couplings, gears, etc., with sufficient drawing-room work to teach the correct method of detailing and dimensioning original designs. Prerequisite: Phys. 1. First semester (3).

M.E. 2. Elementary Heat Engines. Classification and types of engines, governors, valve gears, valve diagrams, indicator diagrams, efficiency. Fuels, combustion, boilers, superheaters, feed water heaters, condensers. First semester (3).

M.E. 4. Elementary Machine Design. A continuation of M.E. 1, including the design of worm gearing, belts, pulleys, bearings, connecting rods, fly-wheels, etc. Prerequisite: Phys. 1. Second semester (3).

M.E. 5. Heat Engines. Continuation of M.E. 2. Second semester (3).

M.E. 6. Mechanism. A study of the kinematic relations of machine parts. Determination of the relative motion of links in a mechanism; development of cams, gears, and transmission machinery from the standpoint of motion only; practical problems developed in the drawing room. Prerequisite: Phys. 1. Second semester (4).

M.E. 9. Engineering Laboratory. Use and calibration of apparatus for measuring weight, volume, pressure, temperature, speed, etc., for engineering purposes. Prerequisite: M.E. 2. Fee, $3.50. First semester (1).

M.E. 10. Thermodynamics. The relations between pressure, volume, temperature, work, and heat for special changes of state; establishment of the fundamental equations of thermodynamics and their adaptation to gases, saturated and superheated vapors. Technical problems. Prerequisite: M.E. 5. First semester (3).

M.E. 11. Engineering Laboratory. Continuation of M.E. 9. Indicator practice on engines in the laboratory and in factories and power plants in the neighborhood; complete working up of indicator diagrams from simple and compound engines, air compressors, etc. Prerequisite: M.E. 2. Fee, $3.50. Second semester (1).

M.E. 15. Thesis. Candidates for the degree of B.S. in M.E. may, with the approval of the department, undertake a thesis as a portion of the work during the second semester of the senior year. Prerequisites: C.E. 9, M.E. 10. Second semester (3).

M.E. 19. Engineering Laboratory. A one semester course selected from the laboratory exercises, for students who take the work only one semester. Prerequisite: M.E. 2, or the equivalent. Fee, $3.50. First semester (1) or second semester (1).

M.E. 21. Engineering Laboratory. A shorter course, selected and condensed from the laboratory exercises, especially in steam engineering. Prerequisite: M.E. 2 or the equivalent. Fee, $3.50. First semester (1).

M.E. 22. Heat Engines. Short course covering steam engines, steam turbines, internal combustion engines, and boiler plants. Prerequisite: Phys. 1. First semester (3).

M.E. 23. Heat Engines. Completion of M.E. 22. Prerequisite: Phys. 1. Second semester (3).

M.E. 24. Engineering Laboratory. A series of experiments and tests of heat transfer, apparatus, calorimetry, heat engines, and auxiliaries. Prerequisite: M.E. 2 or the equivalent. Fee, $3.50. Summer session: eight hours of laboratory work each week-day for four weeks, beginning June 2, 1930. Tuition fee, $40.00. (4).

M.E. 25. Engineering Laboratory. Completion of M.E. 21, along the same lines. Prerequisite: M.E. 5 or the equivalent. Fee, $3.50. Second semester (1).

M.E. 27. Student Apprenticeship or Engineering Construction or Shop Work. Following the junior year, students are required to do a minimum of eight weeks of practical work, preferably as student apprentices, in the work they plan to follow after graduation. A report typewritten and bound is required.

M.E. 29. Heat Engines. A one semester course for non-Mechanical students covering the elementary principles of power plants and auxiliaries. First semester (3) or second semester (3).

M.E. 30. Mechanism. A comprehensive course in the kinematic relation of machine elements, such as gears, links, belts, cams, etc., with representative problems worked in the drawing room. Prerequisite: Phys. 1. First semester (3).

For Advanced Undergraduates and Graduates

Graduate students desiring to take the following courses should present as prerequisites: Integral Calculus, Mechanics of Materials, and Elementary Heat Engines.

M.E. 108. Heat Engines. Theory of steam turbines, internal combustion engines, gas producers, and refrigeration. Class and drawing-room work. Prerequisite: M.E. 5 or the equivalent. Second semester (3).

M.E. 112. Advanced Machine Design. The design of machines in general with special attention to the application of underlying fundamentals in strength to specific problems, practical considerations and the use of standards. Problems covering such machines as hoists, machine tools, hydraulic machines, etc., are worked in a drawing room conducted on the lines of a modern commercial drafting room. Prerequisites: M.E. 4, C.E. 9. First semester (4).

M.E. 113. Mechanical Engineering. Advanced work in thermodynamics, internal combustion engines, and steam turbines, with typical problems. Prerequisites: Math. 6, M.E. 10. First semester (3).

M.E. 114. Engineering Laboratory. Work of M.E. 9 and 11 continued. Tests of boilers, power plants, and pumping stations in the neighborhood. Prerequisite: M.E. 9. Fee, $3.50. First semester (2).

M.E. 116. Advanced Machine Design. A continuation of M.E. 112, with special emphasis on the effect of eccentric loading and inertia forces on the dimensions of machine parts. Prerequisites M.E. 4, C.E. 9. Second semester (4).

M.E. 117. Mechanical Engineering. Continuation of M.E. 113. Advanced work in pumping machinery, air machinery, and refrigeration, with typical problems. Prerequisites: Math. 6, M.E. 10. Second semester (3).

M.E. 118. Engineering Laboratory. Work of M.E. 114 carried forward along the same lines. Analysis of flue gases; complete tests of power plants in the vicinity. Prerequisite: M.E. 11. Fee, $3.50. Second semester (2).

For Graduates

Math. 217 and 218, Theory of Elasticity, may be included in a graduate major in Mechanical Engineering.

M.E. 200. Advanced Engineering Thermodynamics. The development of certain methods of thermodynamics which find particular application in the field of mechanical engineering. Energy equations; availability and entropy; general equations; formulation of vapor properties; action of steam in nozzles and turbines; supersaturation; gas properties; gas reactions in combustion. Prerequisite: graduate standing in engineering. First semester (3). Professor Stuart.

M.E. 201. Advanced Engineering Thermodynamics. Continuation of M.E. 200. Second semester (3). Professor Stuart.

M.E. 203. Internal Combustion Engines. Early inventions and inventors; development of gas engine, vapor engine, heavy oil engine, stationary, portable, self-propelled vehicles on land, on water, in air; cycles; laws of mixing, carburation, atomization; combustion and laws of chemical equilibrium; detonation; heat losses; friction losses in fluids and solids; governing; relay systems. Prerequisite: M.E. 10. First semester (3). Professor Butterfield.

M.E. 204. Internal Combustion Engines. Continuation of M.E. 203. Diesel engine design. Two-stroke cycle, four-stroke cycle, scavenging, compressing, injection, reversing. Marine engines, locomotive engines, stationary engines. Balancing forces and energy flow. Heaters, supercharges, ignition, cooling. Prerequisites: M.E. 10 and 116. Second semester (3). Professor Butterfield.

M.E. 207. Steam Turbines. Theory of the steam turbine, with discussion and analysis of the important formulas and diagrams relating thereto; classification; discussion of the more important types; analysis by means of equations and diagrams; operation and governing; principles underlying the design of turbine parts; critical velocities. Prerequisites: graduate standing in engineering. First semester (3). Professor Klein.

M.E. 208. Steam Turbines. Continuation of M.E. 207. Second semester (3). Professor Klein.

METALLURGICAL ENGINEERING

PROFESSOR STOUGHTON, ASSOCIATE PROFESSOR BUTTS,
ASSISTANT PROFESSOR DOAN, MR. HARVEY

Met. 1. General Metallurgy. A course of lectures discussing the apparatus and general principles of metallurgy. Ores, fuels, combustion, pyrometry, refractories, furnaces, metallurgical processes and products, metals and alloys, slags and fluxes, blast and gases, smoke and fume. Prerequisites: Chem. 1 or 3, Phys. 1 and 4, Math. 20. Second semester (2).

Met. 2. Metallurgy of Iron and Steel. Chemical and physical properties of iron. Iron ores, preparation of ores, the blast furnace, the mixer, remelting, refining, puddling, the Bessemer process, the open-hearth process, duplex process, cementation, manufacture of crucible steel, electric steel, alloy steels, casting, forging, and heat treatment. Prerequisite: Met. 1. First semester (2).

Met. 3. Metallurgy of Copper, Lead, Gold, and Silver. Copper: Chemical and physical properties, ores, smelting sulphide ores, the Bessemer process, treatment of oxide ores, wet process, electrolytic processes. Lead: Chemical and physical properties, ores, smelting processes, condensation of lead fume, refining and desilverization of base buillion. Gold: Chemical and physical properties, ores, gold washing, gold milling, amalgamation, the cyanide process, parting and refining gold and silver. Silver: Chemical and physical properties, ores, smelting, amalgamation, leaching processes. A two-day inspection trip (expense about $15.00) is required. Prerequisite: Met. 1. First semester (2).

Met. 4. Metallurgy of Zinc, Aluminium and the Minor Metals. Zinc: Chemical and physical properties, ores, reduction by furnace and electrolytic processes, electrothermic processes, manufacture of zinc oxide. Mercury: Chemical and physical properties, ores, processes of extraction. Aluminium: Chemical and physical properties, ores, extraction by electrolysis. Tin, Nickel, Platinum, Antimony, etc.: Chemical and physical properties, ores, processes of extraction. A one-day inspection trip (expense about $3.00) is required. Prerequisite: Met. 1. Second semester (2).

Met. 5. Electrochemistry. Lectures and recitations concerning the phenomena of electrolysis and electrolytic conduction; current phenomena; voltage phenomena; energy relations; electrode reactions; the electrolytic cell; primary cells and storage batteries; electric arcs and discharges through gases. Prerequisites: Chem. 20, Phys. 6. First semester (1).

Met. 21. Engineering Metallurgy. An abridgment of Met. 1, 2, 3, and 4, especially adapted to the viewpoint of users of metals. Prerequisite: Chem. 1. First or second semester (2).

Met. 23. Ferrous Metallurgy. Especially adapted from Met. 21 for students taking the curricula in Chemistry and Chemical Engineering. Prerequisite: Chem. 1. First semester (2).

Met. 24. Short Course in Non-Ferrous Metallurgy. Continuation of Met. 23. Second semester (2).

Met. 25. Electrochemistry and Electrometallurgy. A combination of Met. 5 and 106. Prerequisite: Met. 21. First semester (2).

Met. 30. Physical Metallurgy. Physical structure and constitution of metals and alloys; effect thereon of mechanical working, heat treatment, composition, etc.; including polishing and examination of microsections and an introduction to metallography. Lectures and laboratory work. Prerequisites: Met. 1 and 2, or Met. 21 or 23. Fee, $5.00. Second semester (2).

Met. 33. Metallurgical Laboratory. The internal structure of metals and industrial alloys; effect of cold rolling and annealing. Heat treatment of alloys and case-hardening of steels. Foundry experiments. Fatigue and corrosion testing of metals.

Electric arc welding. Use of instruments and apparatus employed in metallurgical work, such as pyrometers, hardness testing machines, microscopes, gas and electric furnaces, etc. Must accompany or follow Met. 21 or 23. Fee, $5.00 First semester (1).

Met. 34. Metallurgical Laboratory. Continuation of Met. 33. Fee, $5.00. Second semester (1).

Met. 35. Electrochemical Laboratory. Quantitative relations in the deposition of metals by electrolysis. Experimental study of the conditions controlling the nature of electrolytic deposits, electrolysis of fused salts, cathodic and anodic reactions. Must accompany Met. 5. Fee, $5.00. First semester (1).

Met. 48. Summer Work. At the end of the sophomore year, eight weeks' practical experience in industrial plants is required of students who do not take Chem. 39 or M.S.T. 9 or 19.

Met. 49. Summer Work. At the end of the junior year students in the curriculum in Metallurgical Engineering are required to secure in industrial plants at least eight weeks' practical experience.

Met. 61. Problems in General Metallurgy. A course of problems embodying the use of physical, chemical, and mechanical principles as the basis of practical metallurgy. Data are taken, as far as possible, from actual practice, so that the results have an important bearing in the understanding of metallurgical processes. Must accompany Met. 1. Prerequisite: Chem. 8. Second semester (1).

Met. 62. Problems in Iron and Steel Metallurgy. A course of problems involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships in the processes. Prerequisites: Met. 1 and 61. Must accompany Met. 2. First semester (1).

Met. 81. Short Course in Metallurgical Engineering Problems. An abridgment of Met. 61 and 62. Prerequisites: Chem. 1 or 3, and 8, Phys. 1, Math. 20. Must accompany Met. 21. First or second semester (1).

Met. 83. Short Course in Metallurgical Engineering Problems. Same as Met. 81, but adapted for students taking the curriculum in Chemical Engineering. Prerequisites: Chem. 1

or 3, and 8, Phys. 1, Math. 20. Must accompany Met. 23. First semester (1).

Met. 84. Short Course in Metallurgical Engineering Problems. An abridgment of Met. 163 and 164. Must accompany Met. 24. Second semester (1).

For Advanced Undergraduates and Graduates

Met. 106. Electrometallurgy. Lectures discussing the practical application of electricity to metallurgical processes; electrothermics; electrolytic and electric furnace plants and practice. Prerequisites: Met. 1 and 5. Second semester (1).

Met. 131. Metallography. Continuation of Met. 30. Study of the structure of metals and alloys, particularly the important industrial alloys such as steel, cast iron, brass, duralumin, etc., with the microscope and other apparatus. The influence of thermal and mechanical treatment on properties and structure. Lectures and laboratory work. Prerequisites: Met. 1 and 2 or Met. 30. Fee, $5.00. First semester (2).

Met. 132. Metallurgical Laboratory. Principles of process metallurgy, such as alloying, galvanizing, measurement of air volume and moisture content, desilverization of lead, cementation of steel, electrolysis, hydrometallurgy, heat transfer, heat conduction, and radiation. Principles of physical metallurgy, such as the effect of mechanical work and heat treatment, influence of impurities, etc. Calibration and use of instruments employed in metallurgical investigations, pyrometers, calorimeters, etc. Determination of efficiencies of furnaces. Experiments with electrochemical processes, electric furnaces, etc. Prerequisites: Met. 1, 2, 3, 5, 35, and 131. Fee, $15.00. Second semester (3).

Met. 139. Seminar. Conference hours of the staff of the department with students, to discuss current metallurgical literature, processes, and problems; involving reading of current English and foreign literature and verbal presentation by the students. Training in the preparation and writing of engineering reports. Inspection visits to plants for smelting, refining, heat treating, rolling, forging, testing, carburizing, and founding of ferrous and non-ferrous metals and alloys; also to manufacturing plants where metals are used, adapted, and applied. First semester (3).

Met. 140. Seminar. Continuation of Met. 139. Second semester (2).

Met. 152. Advanced Metallurgy of Iron and Steel. Continuation of Met. 2 for seniors, who have attained high standing, and for graduate students. Prerequisite: Met. 2. First or second semester (2).

Met. 163. Problems in the Metallurgy of Copper, Lead, Gold, and Silver. A course of problems concerned with the principles utilized in the metallurgy of copper, lead, silver, and gold. Prerequisite: Met. 61. Must accompany Met. 3. First semester (1).

Met. 164. Problems in the Metallurgy of Zinc, Aluminium, and the Minor Metals. A course of problems concerned with the principles utilized in the metallurgy of zinc, aluminium, etc. Prerequisite: Met. 61. Must accompany Met. 4. Second semester (1).

Met. 172. Advanced Physical Metallurgy. A broad course including advanced study in the fundamental fields with a review of the current literature as the study in each field is concluded. Prerequisites: Met. 30 and 131. First semester (2).

Met. 173. Advanced Physical Metallurgy. Continuation of Met. 172. Prerequisite: Met. 2. Second semester (2).

For Graduates

Met. 201. Metallurgical Investigation and Thesis. Study of the literature and investigation of some special metallurgical problems, such as: an improvement or innovation in some metallurgical process; the establishment of an equilibrium diagram of a series of alloys; the effect of heat treatment on a metal or alloy; or some other contribution to metallurgical knowledge, or else confirmation of knowledge not yet fully established. The study and investigation must be embodied in a written report. Prerequisites: Met. 2, 3, or 4. Both semesters (6). Professor Stoughton or Associate Professor Butts or Assistant Professor Doan.

Met. 202. Metallurgical Investigation and Thesis. Continuation of Met. 201. Both semesters (3). Professor Stoughton or Associate Professor Butts or Assistant Professor Doan.

MILITARY SCIENCE AND TACTICS

COLONEL THOMLINSON, CAPTAINS HYDE, TABER, CLAY, WHITTEN, AND SADLER, SERGEANTS LAVIN, MOHRING, AND GASDA

Infantry Unit

An infantry unit of the Reserve Officers' Training Corps was established at Lehigh University in September, 1919. Conducted on a voluntary basis during the year 1919-1920, the unit had a membership of 313 students. A year later the Trustees and Faculty of the University made the Basic Course, Military Science and Tactics, a required subject, under the R.O.T.C. regulations, for physically fit freshmen and sophomores. Provision for this training is made in their schedule of study.

The military courses contemplated under the War Department regulations consist of two years of basic work and two years of elective advanced work along specialized lines. Students who complete the four-year course satisfactorily become eligible for commissions as second lieutenants in the Infantry Officers' Reserve Corps.

Uniform and equipment are furnished by the Government. Each student to whom government property is issued is required to make a cash deposit of $25.00, which is refunded in full upon the return of the property in good condition; this deposit is payable at the time of registration for the first semester. During the advanced course students are paid commutation of subsistence, amounting to approximately $10.00 a month. The number of students who may take the advanced course is limited by the annual appropriations.

Mil. 1. Basic Course, Infantry, First Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in marksmanship, military courtesy, military hygiene and first-aid, physical drill, and command and leadership. Three hours a week. First semester (2).

Mil. 2. Basic Course, Infantry, First Year. Continuation of Mil. 1. Second semester (2).

Mil. 3. Basic Course, Infantry, Second Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in drill and command, musketry, automatic rifle, scouting and patrolling, and combat principles of rifle squad. Students who indicate suitable proficiency in this course are appointed corporals in the R.O.T.C. Unit. Three hours a week. First semester (2).

Mil. 4. Basic Course, Infantry, Second Year. Continuation of Mil. 3. Second semester (2).

Mil. 5. Advanced Course, Infantry, First Year. Theoretical and practical instruction in drill and command, military sketching, map reading, infantry weapons (machine gun, 37 mm. and 3 in. trench mortor), combat principles, rifle and machine gun section and platoon. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. Unit. Five hours a week. First semester (3).

Mil. 6. Advanced Course, Infantry, First Year. Continuation of Mil. 5. Second semester (3).

Mil. 7. Advanced Course, Infantry, Second Year. Theoretical and practical instruction in field enginering, principles of camouflage, organized Reserve Corps regulations, administration, military history and national defense act, combat principles, tactical exercises, map problems, command and leadership, and military law. Students who indicate suitable proficiency in this course are appointed commissioned officers in the R.O.T.C. Unit. Five hours a week. First semester (3).

Mil. 8. Advanced Course Infantry, Second Year. Continuation of Mil. 7. Second semester (3).

Mil. 9. Advanced Camp, Infantry. Compulsory for students who elect the advanced course. Generally held in summer between junior and senior years. (3).

Ordnance Unit

An Ordnance Unit of the R.O.T.C. was established at this University in September, 1925. The course consists of the customary two years of basic training, and two years of advanced work in technical and military subjects. Students in the College of Engineering are eligible, preference being given

to those in Mechanical, Chemical, Metallurgical, and Electrical Engineering. Ordnance students receive the same allowance as do those of the Infantry Unit. Students completing the four-year course satisfactorily are eligible for commissions as second lieutenants in the Ordnance Officers' Reserve Corps.

Mil. 11. Basic Course, Ordnance, First Year. Same as for Infantry. First semester (2).

Mil. 12. Basic Course, Ordnance, First Year. Continuation of Mil. 11. Second semester (2).

Mil. 13. Basic Course, Ordnance, Second Year. Same as for Infantry. First semester (2).

Mil. 14. Basic Course, Ordnance, Second Year. Continuation of Mil. 13. Second semester (2).

Mil. 15. Advanced Course, Ordnance. First Year. Five hours a week, three hours of which are credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: materiel, ammunition and explosives, current ordnance problems. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. Unit. First semester (1½).

Mil. 16. Advanced Course, Ordnance, First Year. Continuation of Mil. 15. Second semester (1½).

Mil. 17. Advanced Course, Ordnance, Second Year. Five hours a week, three hours of which are credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: property accounting and ordnance financial procedure, military law, administration, and supply, organization of the Ordnance Department, industrial mobilization, current ordnance problems, elementary ordnance engineering. Students who indicate suitable proficiency in this course are appointed student commissioned officers, and upon graduation are appointed second lieutenants in the Ordnance Officers' Reserve Corps. First semester (1½).

Mil. 18. Advanced Course, Ordnance, Second Year. Continuation of Mil. 17. Second semester (1½).

Mil. 19. Advanced Camp, Ordnance. Compulsory for students who elect the advanced course. Generally held in summer between junior and senior years. (3).

Mil. 20. Advanced Ordnance. Drill and command. Elective for students taking Mil. 15. First semester (½).

Mil. 21. Advanced Ordnance. Continuation of Mil. 20. Second semester (½).

Mil. 22. Advanced Ordnance. Continuation of Mil. 21. First semester (½).

Mil. 23. Advanced Ordnance. Continuation of Mil. 22. Second semester (½).

A professional trip to the exhibition and annual meeting of the Army Ordnance Association at Aberdeen Proving Ground, Md., is made in October by students taking Mil. 15 and 17.

MINING ENGINEERING

PROFESSOR ECKFELDT, ASSOCIATE PROFESSOR SINKINSON

Mine. 1. Mining Engineering. Prospecting: modes of occurrence of minerals; uses of geology; prospecting for placers, veins, and beds; magnetic prospecting; drilling; sampling; valuation of property; location of claims; patenting mining ground. Boring: uses of bore-holes; methods, by percussion and rotation; survey of bore-holes. Transportation: haulage; surface and underground methods; ropes, motors and cars; aerial tramways; loading and unloading; storage of mineral; transportation of workmen; mine tracks; signaling; hoisting: motors, ropes, receptacles; safety appliances; systems of hoisting. First semester (3).

Mine. 2. Mining Methods. Exploitation: methods of working deposits; location of surface plant; rock-drilling, tools and machines; air compressors; use of explosives and blasting; safety regulations; quarrying; tunneling, slope and shaft sinking; timbering; support of excavations by wood, steel, and concrete; methods of mining; stripping; hydraulicking; dredging; room and pillar; longwall; stoping; filling; caving; top-slicing; robbing. Coal cutting machinery. Conveyors. Mechanical loaders. First semester (3).

Mine. 3. Ore Dressing; Coal Preparation; Laboratory. General principles and physical properties upon which the recovery of minerals from ores is based, followed by detailed study of machines and apparatus used for coarse and fine crushing; classifying and preparation for concentration; various methods of concentration, including gravity and magnetic methods, oil flotation, etc. Study of procedure followed for treatment of ores in typical concentrating plants; visits to mills; experimental work on ores, giving practical application of principles and processes covered. General principles of concentration applied to the preparation of coal. Visits to breakers and coal washers. A well-equipped laboratory gives opportunity for individual as well as class operation of machines and apparatus. Fee, $5.00. First semester (3).

Mine. 5. Mining Engineering. Drainage: surface water, prevention of access; mine dams; tunnel drainage; mechanical drainage, water-hoisting, pumping, classes of pumps. Ventilation: mine air; vitiation of air; natural and mechanical methods of ventilation; systems, multiple entry, splitting; ventilating machines, fans and blowers; testing air; ventilation laws. Lighting: methods in use, safety lamps, electric lighting; safety regulations. First aid: causes of accidents, means of prevention, rescue work; first aid to injured; hygiene of mines. Railroad construction: earthwork, culverts, retaining walls, piling, tunnels, trestles, bridges, track-work; railroad structures. Second semester (3).

Mine. 6. Mine Surveying. Forms for keeping notes; surface surveys; determination of true meridian, latitude, and time from observations on Polaris and Sun; connecting surface surveys with mine surveys through tunnels, slopes, and shafts; calculation of notes; mine mapping; mine problems; practice in mine surveying. Mine railroads: preliminary and location surveys; theory of curves; railroad mapping; calculation of earthwork; curve and compensation problems; practice in railroad surveying. Prerequisite: C.E. 6. Second semester (3).

Mine. 7. Construction. The use of stone, brick, concrete, and wood as structural material for foundations, piling, dams, retaining walls, mine buildings, railroads, trestles, tipples, ore bins, etc. First semester (2).

Mine. 8. Oil Field Practice. Distribution of petroleum and natural gas; valuation of oil lands. Location of wells; development-drilling and production methods. Transportation; storage; fires; avoidable waste and conservation of oil and gas resources. Refining methods; casing-head gasoline. Second semester (2).

Mine. 9. Mine Administration. Organization, employment of labor, management; principles of mining. Second semester (1).

Mine. 10. Fuel Technology. Economic, statistical, scientific aspects. Fuel resources. Analysis of fuels, including gas analysis. Calorimetry; pyrometry; radiometry. Classification of fuels. Colloidal fuels. M.E. students take certain parts of this course. First semester (2).

Mine. 11. Fuel Technology. Theoretical aspects and practice in the utilization of fuels, with the incidental methods of laboratory investigation. Chemical composition of fuels; carbonization at low and high temperatures; complete gasification of fuels, with laboratory practice. Second semester (2).

Mine. 20. Summer Work. Industrial employment for eight weeks, following the junior year, with report.

For Graduates

Students desiring to do graduate work in Mining Engineering should consult with the Professor of Mining Engineering with regard to their qualifications.

Mine. 201. Methods of Mining. The study of methods used in a given mining region, or in the production of a given class of materials, with respect to conditions influencing choice of method and cost. First semester (5). Professor Eckfeldt.

Mine. 202. Methods of Mining. Continuation of Mine. 201. Second semester (5). Professor Eckfeldt.

Mine. 203. Mining Plant. The determination of the efficiency of mining machinery of given types under varying conditions. First semester (5). Professor Eckfeldt.

Mine. 204. Mining Plant. Continuation of Mine. 203. Second semester (5). Professor Eckfeldt.

Mine. 205. Ore-Dressing and Coal Washing Plant. The study of certain operations incident to the dressing of ores or

the preparation of coal. Determination of efficiency of machines and processes. Losses in dressing. First semester (5). Associate Professor Sinkinson.

Mine. 206. Ore-Dressing and Coal Washing Plant. Continuation of Mine. 205. Second semester (5). Associate Professor Sinkinson.

Mine. 207. Fuel Technology Research. Physical and chemical investigations of coals and fuel oils; gas analysis; ignition phenomena; mechanism of combustion; surface combustion; heat recuperation. General study of methods employed in carbonizing coal between 500° and 1200° C., including recovery of byproducts; coal-gas and coking industries. First semester (4). Associate Professor Sinkinson.

Mine. 208. Fuel Technology Research. Continuation of Mine. 207. Second semester (4). Associate Professor Sinkinson.

MUSIC

MR. SHIELDS

Mus. 1. History, Appreciation, and Harmony. A study of the development of music from ancient times to our present time, the forms and types of music in their historical settings with illustrations, and a study of our chordal system and usual chord progressions. First semester (3).

Mus. 2. History, Appreciation, and Harmony. Continuation of Mus. 1. Second semester (3).

PHILOSOPHY, PSYCHOLOGY, AND EDUCATION

PROFESSOR HUGHES,
ASSISTANT PROFESSORS DROWN, MEENES, F. C. BECKER, AND NEWCOMB, MR. STONE,
DRS. HOFFMAN AND KLOPP (LECTURERS)

PHILOSOPHY

Phil. 1. History of Philosophy, Ancient and Mediaeval. A careful study of Plato's *Republic* and other source-material. Lectures on the philosophy of the Middle Ages. Discussions and recitations. First semester (3).

Phil. 2. History of Philosophy, Modern. A study of modern philosophical thought through selected readings. Discussions and lectures. Second semester (3).

Phil. 3. Introduction to Philosophy. The problems that experience and science present for the application of philosophic method. Each semester (3).

Phil. 5. Philosophy of Religion. A study of the function and definition of religion. First semester (1).

Phil. 6. Philosophy of Religion. A study of important teachings of the world religions from the standpoint of philosophy. Prerequisite: Phil. 5. Second semester (1).

Phil. 11. Present-day Ethical Problems. Problems presented by contemporary social conditions. Reading and discussion. Each semester (1).

Phil. 12. Present-day Ethical Problems. Problems of the individual life-career. Discussions. Prerequisite: Phil. 11. Second semester (1).

Phil. 14. Logic and Scientific Method. Formal logic. The history of scientific method. Discussions. Second semester (3).

Reading in Philosophy. In accordance with the announcement on page 47, qualified students may pursue a course of reading in philosophy in connection with the major study in Philosophy. Professor Hughes, Assistant Professor Becker.

For Advanced Undergraduates and Graduates

Phil. 107. Seminar in Philosophy. Each year a topic will be chosen, upon which the professor will present a course of lectures. Each student will select a division of this general topic for his study and report, and will present a paper upon that topic and pass an examination in the subject of the seminar. Prerequisites: two of the following courses: Phil. 1, 2, 3, or 14. First semester (3).

Phil. 108. Seminar in Philosophy. This is conducted similarly to Phil. 107. Second semester (3).

For Graduates

Prerequisite to major graduate work in Philosophy: four undergraduate courses in the subjects of the department, in-

cluding six semester hours in philosophy, or equivalent preparation.

Phil. 201. History of Philosophy: Ancient and Mediaeval. Rise of the Hellenic schools of philosophy, the effect of Greek philosophy upon Christian doctrine; Scholasticism and the Schoolmen. Alternating with Phil. 205. First semester (3). Professor Hughes.

Phil. 202. History of Philosophy: Modern. The emphasis is placed upon Hobbes, Spinoza, Leibnitz, and Locke; upon Kant and Hegel; and upon Bergson and James. Alternating with Phil. 206. Second semester (3). Assistant Professor Becker.

Phil. 205. Plato. Discussion will deal chiefly with contrast between the dialectic and the poetic phases of Plato's thought. Prerequisites: Phil. 1, and 2, 3, or 14. Alternating with Phil. 201. First semester (3). Professor Hughes.

Phil. 206. Spinoza. The *Emendation* and the *Ethics*. Discussion will largely relate to current "philosophies of science." Prerequisites: Phil. 1, and 2, 3, or 14. Alternating with Phil. 202. Second semester (3). Assistant Professor Becker.

Phil. 208. Thesis in Philosophy. First semester (2) or (3). Professor Hughes, Assistant Professor Becker.

Phil. 209. Thesis in Philosophy. Second semester (2) or (3). Professor Hughes, Assistant Professor Becker.

PSYCHOLOGY

Psych. 1. General Psychology. The life-movement and life-career of persons, and the laws found to prevail therein. The processes, conditions, and patterns that characterize personal life. Methods of appraising capacity and achievements. The scope and task of psychology. First semester (3).

Psych. 2. Educational Psychology. The educative process; analysis of mental traits; learning and teaching. Prerequisite: Psych. 1. Second semester (3).

Psych. 4. Social Psychology. The characteristics of human nature that are exhibited in group life. Principles that may be applied by society to the modification of individuals. Second semester (3).

Psych. 5. Introduction to Psychology. A course specially designed for those who have not decided to take any later courses in psychology. Each semester (3).

Psych. 6. Abnormal Psychology. Primarily for seniors in the premedical curriculum. Mental disorders and mental hygiene: the psychology of the emotions and of temperament. Reading, discussions, and a series of clinics at the State Hospital. Prerequisite: Psych. 1, or 5 or 10. Second semester (3).

Psych. 10. Principles of Psychology. A course similar to Psych. 1, but scheduled and modified to meet the needs of students in Business Administration. First semester (3).

Psych. 11. Laboratory and Statistical Psychology. An introduction to laboratory method. Prerequisite: six hours in psychology. First semester (3).

Psych. 12. Laboratory and Statistical Psychology. Similar to Psych. 11, but permitting to qualified students the selection of some specific problem. Second semester (3).

Psych. 15. Psychology applied to Business and Industry. Work and fatigue; motivation; problems of personnel, and of training; psychological factors in display and persuasion; factors that reduce efficiency. Prerequisite: Psych. 1, or 5 or 10. Each semester (3).

Psych. 17. The Psychology of Religion. An examination of the forms of religious experience. First semester (1).

Psych. 18. The Psychology of Religion. A continuation of Psych. 17, which is prerequisite. Second semester (1).

Psych. 19. The Psychology of Conduct. A study of motivation and choice. First semester (1).

Psych. 20. The Psychology of Conduct. Similar to Psych. 19, which is prerequisite. Second semester (1).

Reading and Investigation in Psychology. In accordance with the announcement on page 47, qualified students may pursue a course of reading in psychology, which will include the investigation of some problem, either through experiment or otherwise. Professor Hughes, Assistant Professors Meenes and Newcomb.

For Advanced Undergraduates and Graduates

Psych. 103. Educational Psychology, Advanced. Practice in administering individual and group tests: study of administrative applications and of classical investigations, with some first-hand investigation or experiment. Prerequisite: Psych. 2 or 4 or 15. First or second semester (3).

Psych. 113. Clinical Psychology. A study of exceptional children and of psychopathological symptoms and personalities. Practice in the use of mental tests of many kinds. Prerequisite: six hours in psychology. First or second semester (2) or (3).

For Graduates

Evidence of the satisfactory completion of at least three undergraduate courses in Psychology will be demanded of students who wish to do their major graduate work in psychology.

Psych. 202. Psychological Tests and Measurements. The theory of these tests is studied historically, and also in the effort to formulate and work out new tests. In addition the personnel problem presented by a specific situation, either in a school or in a business firm, is made a matter of detailed investigation. Second semester (2) or (3). Assistant Professor Newcomb.

Psych. 203. Seminar and Thesis in Psychology. First semester (2) or (3). Professor Hughes, Assistant Professors Meenes and Newcomb.

Psych. 204. Seminar and Thesis in Psychology. Second semester (2) or (3). Professor Hughes, Assistant Professors Meenes and Newcomb.

Psych. 205. Experimental Psychology of Perception. Experimentation in the fields of spatial and temporal relations and of the various sense modalities. Special attention to the work of configurational psychologists. First semester (3). Assistant Professor Meenes.

Psych. 206. Experimental Psychology of Perception. Continuation of Psych. 205. Second semester (3). Assistant Professor Meenes.

Psych. 209. Systematic Psychology. The several methods and programs of current psychology in their relation to each other and to the essential purposes of the science. An historical and theoretical study. First semester (3). Professor Hughes.

Psych. 210. Systematic Psychology. Continuation of Psych. 209. Second semester (3). Professor Hughes.

EDUCATION

See also statement concerning preparation for teaching, in description of the College of Arts and Science.

Educ. 1. Introduction to Teaching. Adjusting pupils' school and social interests; introduction of pupil to effective methods of study; subject matter and method relating to technique and routine. First semester (3).

Educ. 2. History of Education. The advance of civilization and culture and the parallel progress of educational theory and practice. (1) Evolution of subject matter. (2) Evolution of educational institutions. (3) Educational leaders. Second semester (3).

Educ. 7. Principles of High School Teaching. Character and qualifications essential to the high school teacher; the character of the high school student; types of class exercises; essential factors and devices: lesson-planning and assignment; the library and source material; problems and projects; exercises in lesson planning, readings, and observations. First semester (3).

Educ. 8. The Political Aspect of School Systems. State and local school systems; political and administrative principles which guide state control of educational agencies. Prerequisite: Educ. 2 or 7. Second semester (3).

Educ. 10. Supervision of Teaching and School Management. Organization and routine of school and classroom; management, discipline, supplies, forms, reports, marking, grading, testing, promotion, the external aspects of teaching. Prerequisite: Educ. 7. Second semester (3).

Educ. 15. Practice Teaching. This work is for the most part carried on in the Bethlehem High School. (1) Observation and report with conference; (2) participation in the

routine work of the class, conduct of study periods, and correcting papers; (3) actual conduct of class, careful study of lesson plans, followed by systematic criticism by the assisting teacher and by the professors of the department. Prerequisite: a course in Education. First semester (3).

Educ. 16. Practice Teaching. Continuation of Educ. 15. Second semester (3).

For courses in special methods see Lat. 10 and 109. Ger. 21, Fr. 95 and 96, P.E. 22, 23, and 24, Phys. 31. For Educational Psychology, see Psych. 2 and 103.

For Advanced Undergraduates and Graduates

Educ. 109. Principles of Education. The theory of education based upon socially determined aims and values, upon biological and psychological factors in the pupil, and upon institutional processes. Summer session (3).

Educ. 111. Problems of Secondary Education. The social background of American secondary education; aims, values, and functions; analysis of each of the secondary subjects. Problems arising out of adolescence; out of individual differences; out of economic and social conditions; programs of studies; administrative problems; extra-curricular activities; the teaching staff; the plant and its equipment; cost and finance. Prerequisites: Educ. 1, and 7 or 10. First semester (3).

Educ. 114. Contemporaneous Education. Readings in current educational literature which explain and indicate trends in the philosophy and practice of education. Second semester (3).

For Graduates

At least three semester courses in education are prerequisite for a graduate major in this field. The prerequisites may be taken concurrently with a partial major program. Attention is called to Educ. 109, 111, and 114 and to Psych. 103, 113, and 202, all of which are open to seniors and graduate students, and which may be accepted towards a major or minor in Education.

Educ. 201. School Administration. State and local systems. How the State organizes its Department of Education, sets up professional standards and initiates educational programs;

how it delegates power in education to subordinate units, and controls county and city districts; how it controls other educational instituions; the home and industry as they supplement education or compete with it. Alternating with Educ. 203. First semester (2). Assistant Professor Drown.

Educ. 202. School Administration. City school systems. The school district and the municipality; organization, function, and personnel of the school board and the administrative and teaching staffs; financial problems of the system; the organization of the teaching program, secondary education, elementary education, vocational and special education, programs and courses of study; supervision, general and special. Alternating with Educ. 204. Second semester (2). Assistant Professor Drown.

Educ. 203. Secondary Education. Renaissance and Reformation influences in secondary education; characteristic types of secondary schools in the United States; problems of adolescence and the secondary schools; secondary school aims and the American social structure. Alternating with Educ. 201. First semester (2). Assistant Professor Drown.

Educ. 203. Secondary Education. Renaissance and Reforma-Secondary school subjects analyzed for their educational values; curriculum problems; administrative problems. Alternating with Educ. 202. Second semester (2). Assistant Professor Drown.

Educ. 205. Junior High School. Articulation of secondary and elementary schools; administrative reforms, curriculum reforms. Summer session (3). Assistant Professor Drown.

Educ. 211. History of Education, Advanced Course. The comparison of past practice and theory with present tendencies is the essential theme or method of this course. Summer session (3). Assistant Professor Drown.

Educ. 213. Educational Systems in America and Europe. A course that relates educational organization to the political and social background. First semester (3). Assistant Professor Drown.

Educ. 215. Seminar and Thesis in Education. Organization of individual studies and investigation about some central

topic. First semester (2) or (3). Assistant Professor Drown and Assistant Professor Newcomb.

Educ. 216. Seminar and Thesis in Education. Conducted similarly to Educ. 215. Second semester (2) or (3). Assistant Professor Drown and Assistant Professor Newcomb.

PHYSICAL EDUCATION

PROFESSOR REITER, ASSISTANT PROFESSOR BARTLETT,
MESSRS. KANALY AND MAHONEY

The aim of the Department of Physical Education is to insure the health and physical development of every student of the University. Facilities for accomplishing this aim are afforded in Taylor Gymnasium, the field house, the two playing levels of Taylor Field, and Lehigh Field.

Each student, upon entering the University, is given a physical examination by the Director of the Students' Health Service, assisted by the Department of Physical Education. He is advised as to postural and physical defects.

All students are required to take regular exercise under Department supervision. This requirement calls for two hours a week in the gymnasium, or participation, under the oversight of the Director, in one of the following organized sports: football, cross country running, basketball, wrestling, swimming, soccer, track, lacrosse, tennis, and baseball. All students are urged and encouraged to participate in these activities. Members of the R.O.T.C. unit may substitute one hour of military drill for one of the two hours of required gymnasium.

Individual exercise is held for the correction of physical and functional defects. This group of students is carefully examined preliminary to taking up the work and guarded during each period.

A large number of activities are offered to the student to choose from, keeping in mind that the well trained man is one who has skill, strength, and speed. A student is encouraged to change his activity whenever it is thought best for the all round development of his personality. Opportunity is offered in the following activities: mass exercises, mass swimming, beginner's swimming, boxing, fencing, apparatus stunts, handball, life saving, athletic dancing, wrestling, and track. All

undergraduate students must swim seventy-five feet before graduation.

In recent years there has been an ever growing demand that the general student body shall reap the benefits of organized sports. This demand is constantly being met by the department in the form of organized activities in all branches. These interests have extended to dormitory, fraternity, interclass, and independent groups. One of the objectives of the department is to interest the student in that form of activity which will provide him with an interest throughout his after life.

Intercollegiate Sports. The coaches cooperate with the Department in the supervision of various intercollegiate freshman and varsity sports. All records of attendance are kept by the Department of Physical Education.

Injuries. Any student who receives a personal injury while engaged in any sport must report the injury as soon as possible to the Professor of Physical Education. The University maintains a well equipped Health Service where medical treatment may be secured.

P.E. 1. Physical Education. Freshman first semester.

P.E. 2 Physical Education. Freshman second semester.

P.E. 3. Physical Education. Sophomore first semester.

P.E. 4. Physical Education. Sophomore second semester.

P.E. 5. Physical Education. Junior first semester.

P.E. 6. Physical Education. Junior second semester.

P.E. 7. Physical Education. Senior first semester.

P.E. 8. Physical Education. Senior second semester.

For Juniors and Seniors

The following courses are open only to juniors and seniors preparing themselves for professional careers in teaching and athletic coaching.

P.E. 22. Theory and Practice of Football. (1) Preliminaries: equipment, conditioning, passing in its various forms, blocking, tackling, following and falling on the ball, punting, drop-kicking, place and goal kicking, methods of warding off and eluding the tacklers. (2) Offense: the advantages and disadvantages of the "huddle system" vs. the old system of signals. The various systems of plays among the colleges.

(3) Defense: the various systems in use and their application in the different zones of the field. The strategy of meeting open, closed, and kick formations. Defense for forward passes, kicks, etc. Team play, field tactics, coaching systems, individual positions, the coach and his personality, and the development of personality in players. The place of scouting, planning the practice periods, play work, and fatigue. Special stress upon sportsmanship, ethical and educational factors relating to the game; considerable time spent on first aid and treatment of injuries, training, and personal hygiene. Throughout the course the discussion and interpretation of the rules. Text books and discussion. Three exercises in class room, one hour practical demonstration. Text book reading and discussion. Second semester (3).

P.E. 23. The Organization and Administration of Physical Education: Theory. A course dealing with the problems of the organization and supervision of physical education programs. This course includes the history of physical education systems, the administration of intramural activities, the qualifications of physical educators, the methods of teaching, and the planning of programs. Text-book is Williams' *Principles of Physical Education.* Outside readings, reports, and surveys required. Second semester (2).

P.E. 24. The Organization and Administration of Physical Education: Practice. The practice of teaching mass physical activities, including athletics, combatitive events, gymnastic games, apparatus stunts, and efficiency tests. Programs of corrective exercise for postural defects will be considered. The student is given an opportunity to do creative work in the field of physical education. Three hours practice a week. Second semester (1).

PHYSICS

PROFESSOR BIDWELL, ASSOCIATE PROFESSOR BAYLEY,
ASSISTANT PROFESSORS CARWILE, PETERSEN, BERGER, FREY,
AND C. R. LARKIN,
MESSRS. F. A. SCOTT, BAILEY, HENSHAW, HOLMES, OSTEEN, BINKLEY,
CLEMMER, LEIDICH, MOWRER, AND SHUGART

Phys. 1. Elementary Physics. Lecture demonstrations and conferences. First or second semester (4).

Phys. 4. Mechanics, Heat, and Light. Recitations. Prerequisites: Phys. 1, Math. 4. Second semester (3).

Phys. 5. Physics Laboratory. Mechanics, Heat, and Light. Prerequisites: Phys. 1, Math. 4. (Should be taken simultaneously with Phys. 4.) Fee, $6.00. Second semester (1).

Phys. 6. Electricity, Magnetism and Sound. Recitations. Prerequisites: Phys. 1, Math. 4. (Math. 4 may be taken simultaneously with Phys. 6.) First semester (3).

Phys. 7. Physics Laboratory. Electricity, Magnetism, and Sound. Prerequisites: Phys. 1, Math. 4. (Should be taken simultaneously with Phys. 6.) Fee, $6.00. First semester (1).

Phys. 10. Electrical Laboratory. Precise measurements. Prerequisites: Phys. 1, 6, and 7. Fee, $6.00. First semester (1).

Phys. 11. Electrical Laboratory. Precise measurements. Continuation of Phys. 10. Prerequisite: Phys. 10. Fee, $6.00. Second semester (1).

Phys. 12. Introduction to Physics. A survey course for students in the Colleges of Arts and Science and of Business Administration. A brief introduction to the principal fields of physics. Lecture demonstrations, recitations, and laboratory. Fee, $6.00. First semester (3).

Phys. 13. General Physics. A dovetailed expansion of the first half of Phys. 12, without repetition. Lecture demonstrations, recitations, and laboratory. Prerequisites: Phys. 12 and Math. 1 or Math. 1a or equivalent. Fee, $6.00. Second semester (3).

Phys. 14. General Physics. A dovetailed expansion of the second half of Phys. 12, without repetition. Lecture demonstrations, recitations, and laboratory. Prerequisite: Phys. 13. Fee, $6.00. First semester (3).

Phys. 15. Modern Physics. A non-mathematical introduction to contemporary phenomena and theories in physics. Lecture demonstrations, recitations, and laboratory. Prerequisite: Phys. 14. Fee, $6.00. Second semester (3).

Phys. 13, 14, and 15 are offered for those who desire a further study of physics as an elective, for pre-medical students, and

for those who wish to begin a major in physics. Phys. 13 and 14 are designed as one complete course, a fuller and more thorough treatment of the general phenomena of physics than Phys. 12.

Phys. 31. Teaching of Physics in Secondary Schools. Principles of scientific methods, study of class room practices in neighboring schools, text-books, and methods. First semester (2).

Phys. 50. Following the junior year, students in the curriculum in Engineering Physics are required to spend at least eight weeks in industrial employment and to present a written report.

For Advanced Undergraduates and Graduates

Phys. 120. Electric Oscillations and Electric Waves. A theory course dealing with electric oscillations and waves and high frequency phenomena. Prerequisites: Math. 4, Phys. 6 or 14. First semester (3).

Phys. 122. Physical Optics and Spectroscopy. A course dealing with the wave theory of light, interference, diffraction, polarization, etc.; exposition of some phases of spectroscopic phenomena. Prerequisites: Math. 4, Phys. 4 and 6, or 14. First semester (3).

Phys. 124. Electric Discharge Through Gases. A theory course covering properties of gaseous ions, the experimental data leading to the electron theory, including a study of vacuum tube phenomena, ionization and resonance potential, photoelectricity, etc. Prerequisites: Math. 4, Phys. 6 or 14. Second semester (3).

Phys. 126. Heat. A theory course dealing with thermometry, heat transfer, pyrometry, kinetic theory, and an introduction to thermodynamics. Prerequisites: Math. 4, Phys. 4 and 6, or 14. Second semester (3).

Phys. 127. Intermediate Laboratory. Laboratory work concurrent with Phys. 120 and 122. Requisite: Phys. 120 or 122, concurrent. Fee, $6.00. First semester (1) or (2).

Phys. 128. Intermediate Laboratory. Laboratory work concurrent with Phys. 124 and 126. Requisite: Phys. 124 or 126, concurrent. Fee, $6.00. Second semester (1) or (2).

Phys. 160. Introduction to Modern Physical Theories. A lecture course on recent developments, including Maxwell's field equations, photo-electricity, radiation, the quantum theory, and the structure of the atom. Prerequisites: Phys. 6 or 14, Math. 4. First semester (3).

Phys. 161. Introduction to Modern Physical Theories. Continuation of Phys. 160. Prerequisite: Phys. 160. Second semester (3).

Phys. 162. Introductory Theory of Electricity and Magnetism. Magnetic fields and potentials; electrostatic fields, potentials and capacities; the Maxwell-Thomson theory of lines of force; electromagnetic fields; variable and alternating currents. Prerequisites: Phys. 6, Math. 4. First semester (3).

Phys. 163. Introductory Theory of Electricity and Magnetism. Continuation of Phys. 162. Prerequisite: Phys. 162. Second semester (3).

Phys. 164. Advanced Laboratory. Laboratory work of research type. Special problems assigned and the student placed very much on his own initiative. Prerequisites: Math. 4, Phys. 127 and 128 or their equivalent. Phys. 162 should ordinarily be taken concurrently. Fee, $6.00. First semester (1) or (2).

Phys. 165. Advanced Laboratory. Continuation of Phys. 164. Prerequisites: Math. 4, Phys. 127 and 128 or their equivalent. Fee, $6.00. Second semester (1) or (2).

For Graduates

Math. 219 and 220, Selected Topics in Quantum Mechanics and Relativity, may be included in a graduate major in Physics.

Phys. 200. Introduction to Mathematical Physics. The application of mathematical analysis to physics. The subjects treated include attraction, hydrodynamics, heat conduction, wave motion, electromagnetic theory and thermodynamics. Prerequisites: Math. 6, Phys. 6 or their equivalent. Not given in 1929-1930. First semester (3). Assistant Professor Larkin.

Phys. 201. Kinetic Theory. The classical considerations of the kinetic theory of gases substantially as in Jäger with some

additional applications to electrical phenomena. Prerequisites: Math. 6, Phys. 126 or their equivalent. Not given in 1929-1930. First semester (3). Assistant Professor Petersen.

Phys. 202. THERMODYNAMICS. A course devoted principally to classical thermodynamics following Planck. Prerequisites: Math. 6, Phys. 126 or their equivalent. Not given in 1929-1930. Second semester (3). Assistant Professor Petersen.

Phys. 203. THEORY OF ELECTRICITY. Electrostatics, electrodynamics, and electromagnetic theory treated principally from the classical viewpoint. Prerequisites: Phys. 162, 163, Math. 6 or their equivalent. Not given in 1929-1930. Second semester (3). Assistant Professor Carwile.

Phys. 206. WAVE MOTION AND SOUND. The kinematics and dynamics of wave motion, the theory of vibrating systems, the production, propagation, and detection of sound. Prerequisites: Math. 6, Phys. 4 or their equivalent. Not given in 1930-1931. First semester (3). Assistant Professor Larkin.

Phys. 207. THEORY OF LIGHT. The propagation of light, interference, diffraction; the measurement of wave-length, crystal optics; introduction of quantum theories of the interpretation of spectra. This course follows Shuster and Nicholson's *Theory of Optics*. Prerequisites: Math. 6, Phys. 122 or their equivalent. Not given in 1930-1931. First semester (3). Assistant Professor Petersen.

Phys. 208. THEORY OF LIGHT. Continuation of Phys. 207. Prerequisite: Phys. 207. Not given in 1930-1931. Second semester (3). Assistant Professor Petersen.

Phys. 209. ADVANCED DYNAMICS. Principles of statics and dynamics; Lagrange's equations with application to particles and rigid bodies, and the theory of oscillations. Prerequisites: Math. 6, Phys. 4 or their equivalent. Not given in 1930-1931. Second semester (3). Assistant Professor Larkin.

Phys. 211. PHYSICS SEMINAR. Reports on current literature and research in progress. First semester (1). Professor Bidwell.

Phys. 212. PHYSICS SEMINAR. Continuation of Phys. 211. Second semester (1). Professor Bidwell.

PSYCHOLOGY

See Philosophy, Psychology, and Education

ROMANCE LANGUAGES

PROFESSOR FOX, ASSOCIATE PROFESSOR TOOHY,
ASSISTANT PROFESSORS H. C. BROWN AND SOTO,
MESSRS. D. G. SCOTT, FARNÉ, AND CARTER

FRENCH

Fr. 1. Elementary French. First semester (3).

Fr. 2. Elementary French. Continuation of Fr. 1. Prerequisite: Fr. 1 or the equivalent. Second semester (3).

Fr. 11. Intermediate French. Prose and poetry. Balzac, Flaubert, Daudet, Moliere, Corneille, Racine. Society in the seventeenth century. Drill in speaking and writing. Primarily for students in Arts and Science and Business Administration who have had two years of entrance French. First semester (3).

Fr. 12. Intermediate French. Continuation of Fr. 11. Second semester (3).

Fr. 21. French Classics. Based on the reading of a number of texts selected mainly from seventeenth and eighteenth centuries. While the main emphasis is placed on correct translation, an accurate knowledge of grammatical construction, idiomatic locutions, and the acquisition of volume in the matter of vocabulary, literary values are also considered and outside reading is assigned on relevant chapters in some history of French literature. Prerequisite Fr. 11. First semester (3).

Fr. 22. French Literature in the Seventeenth and Eighteenth Centuries. Continuation of Fr. 21. Prerequisite: Fr. 11. Second semester (3).

Fr. 31. French Literature in the Nineteenth Century. Prerequisite: Fr. 21. First semester (3).

Fr. 32. French Literature in the Nineteenth Century. Prerequisite: Fr. 21. Second semester (3).

Fr. 33. Contemporary French Literature. Prerequisite: Fr. 21. First semester (3).

Fr. 34. Contemporary French Literature. Continuation of Fr. 33. Prerequisite: Fr. 21. Second semester (3).

Fr. 93. French Oral Composition. Texts and Methods. A course for students who wish a greater opportunity to practice in the oral and written use of modern French prose. Specially recommended for those who expect to teach French. Prerequisite: permission of instructor in charge of the course. First semester (3).

Fr. 94. French Oral Composition. Texts and Methods. Continuation of Fr. 93. Second semester (3).

For Advanced Undergraduates and Graduates

Fr. 141. French Literary History. General review of French literature. Reading, lectures, and explanation of texts. Prerequisite: Fr. 21. First semester (3).

Fr. 142. French Literary History. Continuation of Fr. 141. Prerequisite: Fr. 21. Second semester (3).

Fr. 145. Seminar. A study of the works of some author or group of authors or of a period. Prerequisite: Fr. 21. First semester (3).

Fr. 146. Seminar. Continuation of Fr. 145. Prerequisite: Fr. 21. Second semester (3).

Fr. 151. French Literature in the Sixteenth Century and Earlier. Prose and poetry. Rebelais, Montaigne, Marot, Villon, Froissart, Commynes. Prerequisite: Fr. 21. First semester (3).

Fr. 152. French Literature in the Sixteenth Century and Earlier. Continuation of Fr. 151. Prerequisite: Fr. 21. Second semester (3).

For Graduates

Prerequisites: Graduate students who major in French must have completed not less than twelve semester hours of French language and literature above the standard intermediate courses. A reading knowledge of Latin and German is desirable; a general knowledge of English literature is required.

Fr. 201. Old French. Grammar, Schwan-Behrens. Earlier texts. *Chanson de Roland.* Given in 1930-1931. First semester (3). Associate Professor Toohy.

Fr. 202. Old French. Continuation of Fr. 201. Second semester (3). Associate Professor Toohy.

Fr. 251. The History of the Novel in France. This course traces the growth of the novel as a form of literature and its various transformations. A number of the representative masterpieces of different periods are read, and both their technical qualities and their relation to the social and intellectual environments are studied. Particular attention is given to the preparation and development of realism in the nineteenth century. Given in 1930-1931. First semester (3). Assistant Professor Brown.

Fr. 252. The History of the Realistic Novel in France. Continuation of Fr. 251. Second semester (3). Assistant Professor Brown.

Fr. 255. French Social Forces. As exemplified in modern French literature. Given in 1930-1931. First semester (3). Mr. Scott.

Fr. 256. French Social Forces. Continuation of Fr. 255. Second semester (3). Mr. Scott.

SPANISH

Span. 1. Elementary Spanish. First semester (3).

Span. 2. Elementary Spanish. Continuation of Span. 1. Prerequisite: Span. 1 or the equivalent. Second semester (3).

Span. 11. Intermediate Spanish. Continuation of Span. 2. Prerequisites: Span. 1 and 2. First semester (3).

Span. 12. Intermediate Spanish. Continuation of Span. 11. Second semester (3).

Span. 21. Spanish Novels and Plays. Continuation of Span. 12. Prerequisite: Span. 11. First semester (3).

Span. 22. Spanish Novels and Plays. Continuation of Span. 21. Prerequisite: Span. 11. Second semester (3).

Span. 93. Spanish Oral Composition. A course for students who wish a greater opportunity to practice in the oral and written use of Spanish prose. Specially recommended for those who expect to teach Spanish. Prerequisite: permission of instructor in charge of course. First semester (3).

Span. 94. Spanish Oral Composition. Continuation of Span. 93. Second semester (3).

For Advanced Undergraduates and Graduates

Span. 135. Spanish American Literature. Social and historic forces in Spain and the Spanish American republics as exemplified in the modern literature of those countries. Prerequisite: Span. 21. First semester (3).

Span. 136. Social and Historic Forces. Continuation of Span. 135. Prerequisite: Span. 21. Second semester (3).

Span. 141. Spanish Fiction of the Sixteenth and Seventeenth Centuries. Study of the novel in the Golden Age of Spanish literature, especially of Cervantes' Don Quixote. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 21. First semester (3).

Span. 142. Spanish Drama of the Sixteenth and Seventeenth Centuries. Plays of Lope de Vega, Tirso de Molina, and Calderón. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 21. Second semester (3).

Span. 143. Seminar. A study of the works of some author or group of authors or of a period. Prerequisite: Span. 21. First semester (3).

Span. 144. Seminar. Continuation of Span. 143. Prerequisite: Span. 21. Second semester (3).

For Graduates

Prerequisites: Graduate students who major in Spanish must have completed not less than twelve semester hours of Spanish language and literature above the standard intermediate courses. A reading knowledge of Latin and French is desirable.

Span. 201. Old Spanish. Ford's *Old Spanish Readings*. Given in 1930-1931. First semester (3). Assistant Professor Soto.

Span. 202. Old Spanish. Continuation of Span. 201. Second semester (3). Assistant Professor Soto.

Span. 251. The Modern Spanish Novel. Works of Galdós., Alarcón, Valera, Pereda, Valdés, Pardo Bazan, Ibáñez, Valle Inclán, Baroja. Reading, reports, and lectures. Given in 1931-1932. First semester (3). Assistant Professor Soto.

Span. 252. The Modern Spanish Novel. Continuation of Span. 251. Second semester (3). Assistant Professor Soto.

ITALIAN

Ital. 1. Elementary Italian. Grammar and composition; rapid reading of easy modern prose. First semester (3).

Ital. 2. Elementary Italian. Continuation of Ital. 1. Second semester (3).

Ital. 11. Intermediate Italian. Masterpieces of classic periods. Outside reading. Prerequisites: Ital. 1 and 2. First semester (3).

Ital. 12. Intermediate Italian. Continuation of Ital. 11. Second semester (3).

SPANISH

See Romance Languages

CHAPEL

As a pre-requisite to graduation it is required that students elect either chapel attendance for two years or Present-day Ethical Problems for one year or Philosophy of Religion for one year. The requirement may be satisfied by any one of the following methods: (1) By attendance at the regular chapel exercises on an average of at least three times a week (out of the possible total of five such exercises given each week) for two years; (2) by the satisfactory completion of the courses in Philosophy of Religion: Phil. 5 and Phil. 6; (3) By the satisfactory completion of the courses in Present-day Ethical Problems: Phil. 11 and Phil. 12. Chapel exercises, consisting of brief addresses, readings from religious literature, and selections from classical music, are held daily from Monday to Friday inclusive, from 7:45 to 8:00 A.M.

SUMMER SESSION

The various courses given during the summer are administered by the Director of the Summer Session and a faculty consisting of those teaching in the summer session. All courses are conducted in accordance with the same standards, and may be credited towards a degree on the same basis, as courses given in the first and second semester. Women are admitted to the summer session either as graduate or as undergraduate students on the same terms as men.

The courses offered during the summer session are arranged in three distinct groups: (1) Courses which are an integral part of certain engineering curricula, (2) Courses in a large variety of subjects offered primarily for undergraduates who wish to secure advanced credits or to make up deficiencies, (3) Professional courses designed primarily for teachers.

Certificates of academic credit are issued, on request, for all courses satisfactorily pursued.

The following courses were offered in the summer of 1929. The Summer Session Announcement, containing full description of courses to be offered in 1930, and information concerning admission, fees, etc., will be sent to any address on request.

REQUIRED COURSES IN ENGINEERING

June 3 to June 29

C.E. 6	Land and Topographic Surveying	(4)
Chem. 39	Assaying, Coal, Gas, and Oil Analysis	(4)
M.E. 24	Engineering Laboratory	(4)

July 1 to July 13

C.E. 7	Railroad Surveying	(2)

OPTIONAL COURSES

July 1 to August 10

Astr. 1	Descriptive Astronomy	(3)
Biol. 1	Biology	(3)
Biol. 7	Elementary Biology	(3)
Biol. 153	Advanced Bacteriology	(3)
Bus. 1	Industrial Evolution	(3)
Bus. 2	Industrial Evolution	(3)
Bus. 3	Economics	(3)

Bus. 4	Economics	(3)
Bus. 11	Accounting	(3)
Bus. 12	Accounting	(3)
Bus. 161	Sociology	(3)
Chem. 1	Elementary Chemistry	(2)
Chem. 6	Advanced Chemistry	(3)
Chem. 8	Stoichiometry	(1)
Chem. 11	Chemistry Laboratory	(2)
Chem. 12	Chemistry Laboratory	(1)
Chem. 20	Qualitative Analysis	(3)
Chem. 21	Qualitative Analysis	(2)
Chem. 99	Research Chemistry Laboratory	(2)
C.E. 1	Engineering Drawing	(2)
C.E. 2	Engineering Drawing	(2)
C.E. 150	Thesis	(4)
E.E. 2	Direct Current Machinery	(3)
E.E. 50	Dynamos and Motors, General	(2)
E.E. 52	Alternating Currents, General	(2)
E.E. 123	Thesis	(3)
Engl. 1	Composition and Literature	(3)
Engl. 2	Composition and Literature	(3)
Engl. 117	Drama	(3)
Engl. 122	Contemporary Literature	(3)
Engl. 123	Shakespeare	(3)
Engl. 126	English Literature of the Nineteenth Century	(3)
Fr. 2	Elementary French	(3)
Fr. 12	Intermediate French	(3)
Ger. 2	Elementary German	(3)
Ger. 4	Intermediate German	(3)
Govt. 51	American Government (National)	(3)
Hist. 13	United States History	(3)
Hist. 129	American Foreign Policy	(3)
Lat. 21	Ancient History	(3)
Lat. 22	Ancient History	(3)
Math. 1	Plane Trigonometry	(3)
Math. 2	Algebra	(3)
Math. 3	Analytic Geometry	(3)
Math. 4	Elements of Calculus	(3)
Math. 5	Applications of Calculus	(3)
Math. 6	Advanced Calculus	(3)
Math. 16	Solid and Spherical Geometry and Spherical Trigonometry	(3)
Math. 20	Elementary Mechanics	(4)
Math. 21	Analytic Mechanics	(3)
M.E. 1	Elementary Machine Design	(3)
M.E. 2	Elementary Heat Engines	(3)
M.E. 4	Elementary Machine Design	(3)
M.E. 5	Heat Engines	(3)
Phil. 11	Ethics	(1)
Phil. 12	Ethics	(1)

Phil. 201	History of Philosophy: Ancient and Mediaeval	(3)
Phys. 1	General Physics	(3)
Phys. 4	Mechanics, Heat, and Light	(3)
Phys. 5	Physics Laboratory	(1)
Phys. 6	Electricity, Magnetism, and Sound	(3)
Phys. 7	Physics Laboratory	(1)
Phys. 13	General Physics	(3)
Psych. 1	General Psychology	(3)
Psych. 2	Educational Psychology	(3)
Psych. 4	Social Psychology	(3)
Psych. 5	Introduction to Psychology	(3)
Psych. 6	Abnormal Psychology	(3)
Psych. 10	Principles of Psychology	(3)
Psych. 15	Psychology applied to Business and Industry	(3)
Psych. 113	Clinical Psychology	(3)
Psych. 209	Systematic Psychology	(3)
Span. 2	Elementary Spanish	(3)
Span. 12	Intermediate Spanish	(3)

PROFESSIONAL COURSES FOR TEACHERS

July 1 to July 10

Educ. 205	Junior High School	(3)
Educ. 213	Educational Systems in America and Europe..	(3)
Psych. 2	Educational Psychology	(3)

LEHIGH INSTITUTE OF RESEARCH

The Lehigh Institute of Research was organized in 1924 to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University, and in recognition of the need for further and more exact knowledge in science and in the applications of science to the affairs of modern life.

The purposes of the Institute of Research include (1) the training of men for research work, (2) the publication of the results of investigations, (3) the conduct of general research, (4) the conduct of cooperative research, (5) the conduct of commercial tests and advisory service.

Detailed information concerning the organization and regulations of the Institute of Research are given in a pamphlet which will be furnished on request.

BUILDINGS AND GROUNDS

The University occupies nineteen buildings and its grounds cover one hundred eighty acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the city of Bethlehem.

PACKER HALL

Packer Hall, completed in 1869, is four stories in height, 215 feet long and 60 feet wide. It is built of sandstone in the English Gothic style of architecture.

The Department of Civil Engineering occupies the greater part of the first and second floors. On the first floor are a lecture room, two recitation rooms, a large drawing hall, two instrument rooms, two offices, and a library room. The instrument rooms contain forty-five transits, forty-five levels, a large geodetic theodolite, ten plane tables, and other instruments for engineering field work. In the library room is a collection of plans of engineering structures. On the second floor are two drawing-rooms, three recitation rooms, and offices.

The offices and recitation rooms of the Department of Mathematics and Astronomy are located on the third and fourth floors.

The offices and class rooms and laboratory of the Department of Philosophy, Psychology, and Education are on the first, second, and third floors. At the west end the laboratory has the standard equipment for the several courses in experimental psychology that are offered, with some provision for special research.

THE WILLIAM H. CHANDLER CHEMISTRY LABORATORY

The Chemistry Laboratory is a fire-proof sandstone building, 259 feet in length by 44 in width, with two wings, each 62 feet in length by 42 feet in width. An extension of the Chemistry Laboratory, three stories high, in architectural conformity with the main building, has inside dimensions of 60 feet by 37 feet.

In the Chemistry Laboratory there are two principal stories, a basement, and a top story given over to special research laboratories. The upper floor is occupied by the quantitative and the qualitative chemical laboratories. These rooms are 22 feet in height, and are well lighted and ventilated. Laboratories for research chemistry and the supply room are also on this floor.

The first floor contains a large lecture room, a smaller lecture room, a recitation room, a chemical museum, and laboratories for organic chemistry, sanitary chemistry, industrial biochemistry, special colloid chemistry, X-ray analysis, and advanced research.

In the basement is a large laboratory for the furnace assay of ores and a well-appointed laboratory for gas analysis; also rooms containing the apparatus for chemical engineering and for processes in industrial chemistry, experimental refrigeration unit, air pump for pressure and vacuum filtration, etc.

The laboratories of the Department of Chemistry are equipped with apparatus for teaching chemistry and chemical engineering and for research investigations.

The Trustees of the University named this building the William H. Chandler Chemistry Laboratory in recognition of Dr. Chandler's thirty-five years' service as Professor of Chemistry, 1871-1906.

Additional laboratory space for the larger chemical engineering equipment is provided in the W. A. Wilbur Engineering Laboratory and Power House.

THE PHYSICS LABORATORY

The Physics Laboratory is a four-story sandstone building, 240 feet long, 44 to 56 feet wide. It formerly housed both the Department of Physics and the Department of Electrical Engineering but was taken over in its entirety by the Department of Physics after the removal of the Department of Electrical Engineering in 1929 to new quarters. Extensive remodeling in the summer of 1929 resulted in a physics laboratory modern in every respect and with full facilities for lecture and laboratory instruction and for research.

The halls, stairways, and apparatus rooms are fireproof, the remainder of the building of heavy mill construction. On the first floor are located in the west wing the shops which include a student's machine shop, wood shop, mechanician's shop, and glass blowing room; in the east wing are the generator room, storage battery room, and a large laboratory given over to advance work in light and heat. In addition there are in the basement nine research rooms and a constant temperature, sound-proof room in the sub-basement, all equipped with water, gas, compressed air, and electric power outlets.

On the first floor the large sophomore laboratory occupies the entire east wing; junior and senior laboratories the west wing. The Department offices are on this floor in the center of the building. A large lecture room occupies the east wing of the third floor; the freshman laboratory, reading room, and small lecture room the west wing. The central sections of the third and fourth floors are given over to class rooms. There are eight dark rooms on the fourth floor equipped for work in photometry and spectroscopy.

Two 16-Kw General Electric motor-generators supply D-c power at 110-volts to all laboratories and research rooms. These rooms are also supplied with 110-volt A-c power and with dead lines going to the main distributing board where storage battery power is available.

THE W. A. WILBUR ENGINEERING LABORATORY AND POWER HOUSE

The W. A. Wilbur Engineering Laboratory was erected in 1902; in 1907 the original building was doubled in size to provide for the heating and power plant of the University. The building is of sandstone, conforming in material to the adjacent Chemistry and Physics Laboratories. It is 44 feet wide by 188 feet long, one story high in the boiler room, but with a raised engine room forming a second story at either end.

In 1928 the heating plant was re-equipped to provide service for the Packard Laboratory building and for the Library extension. The plant now contains three Babcock and Wilcox straight-tube cross-drum boilers, each rated at

300 boiler horse power; three Coxe chain grate stokers, two turbine driven Sturtevant blowers, and coal, water, and ash handling equipment of modern design. The plant is designed and equipped to provide steam at 250 lbs. pressure to the engineering laboratory, in addition to heating the University buildings. It is so arranged that any boiler can be isolated for laboratory tests for long periods if necessary. From this plant a six-inch line carries steam to the new Packard Laboratory at the pressure desired for the laboratory work. Modern safety appliances and measuring equipment have been incorporated.

A coal-storage yard north of the building has room for a season's supply of coal, and a system of belt-conveyors and bucket-elevators is provided for receiving coal, dumping it on storage pile, and conveying it into the boiler room as needed.

A floor space of 45 feet by 70 feet in the old boiler house is now used as a laboratory. It contains a 150-horse power suction gas producer for anthracite coal, which is used for laboratory testing work.

This building bears the name of Mr. W. A. Wilbur in grateful recognition of the work he has done for Lehigh University.

WILLIAMS HALL

Williams Hall, the donation of Dr. Edward H. Williams, jr., of the Class of '75, was so named by the Trustees of the University not only in recognition of this gift but also of Dr. Williams' long continued and important service to the University as an alumnus and as Professor of Mining and Geology.

Williams Hall is 186 feet long by 70 feet wide. The building is devoted to the Departments of Metallurgical Engineering, Geology, and Biology.

The eastern end of the building contains the class-rooms, laboratories, and offices of the Department of Metallurgical Engineering. These include the following: In the basement a heat-treating laboratory equipped with gas and electric furnaces of various types; a welding laboratory equipped with industrial welding apparatus of all the principal types, for

demonstration and research purposes; and a furnace room with gas and electric furnaces for melting and casting metals, making alloys, etc. An Ajax-Northrup high-frequency induction furnace is included in this equipment.

On the first floor are located the laboratories for work in physical metallurgy and electrometallurgy. The metallographic laboratory is provided with one Leitz, one Bausch & Lomb, and one Pellin microscope with accessory apparatus for making photomicrographs at various magnifications; also a photomicrographic projection room, and rooms for printing and developing. A Rockwell dilatometer is also contained in this laboratory. The preparation and testing room contains a work-bench, polishing and grinding wheels, Brinell, Rockwell, and Shore apparatus for hardness testing, and magnetic testing apparatus. The newly equipped electrolytic laboratory is provided with alternating and direct current and with suitable apparatus for current and voltage control; also with electroplating equipment and with sinks, hood, and all necessary apparatus for making chemical analyses incidental to metallurgical research.

On the second floor there is the departmental office and the Joseph W. Richards Metallurgical Library, founded on the collection of Professor Richards, for many years head of the department, which he bequeathed to the department on his death.

The Department of Geology has on the first floor a large lecture room, a room containing the paleontological collections, a room devoted to maps and map studies, a room which serves for recitation purposes and also as a laboratory for economic geology, a laboratory of petrology and petrography, a department library, and two offices. The lecture room contains specimens of rocks and fossils, illustrating the work in general geology, and a stereopticon. The laboratory of petrography is provided with petrographic microscopes and study collections of rocks and rock sections representing type localities from different parts of the world. The recording instruments of the meteorological laboratory are also located in the hallway of the first floor, although most of the instruments are placed on the towers of the Library with electrical connection to Williams Hall. In the basement are the mineralogi-

cal laboratory, the blowpipe analysis laboratory, a small chemical laboratory for analytical work, a room fitted with apparatus run by motors for cutting and polishing thin rock sections, the mineralogical collections and a store room containing supplies, surplus illustrative materials, and collections only occasionally used. The mineralogical museum contains many valuable collections and is constantly receiving additions. The foundation of the museum is the collection of Professor Theodore W. Roepper, the first professor of mineralogy in Lehigh University. On the third floor there are three rooms devoted to advanced work and geological research, also a dark room.

The Department of Biology has its offices, large lecture room, recitation room, working library, and laboratories on the second floor. A separate building, the vivarium, containing a greenhouse and animal rooms, is entered from the research laboratory of bacteriology. The student and research laboratories of this Department are all thoroughly equipped with necessary modern appliances.

The students' rooms, used by the Mining and Geological Society and the Metallurgical Society, are located in the basement.

On the third floor there are a large lecture room, seating 208, and an examination and laboratory room, provided with drafting desks. These two rooms are for the joint use of the three departments housed in Williams Hall. The lecture room contains the museum collection of the Metallurgical Department and its diagrams and projection apparatus for lantern slides, opaque objects, and motion pictures.

THE FRITZ ENGINEERING LABORATORY

The late John Fritz, of Bethlehem, known as the father of the steel industry in the United States, a member of the Board of Trustees dating from the founding of the University, gave to the University the funds for the erection and thorough equipment of an engineering laboratory. The building was designed and erected in 1910 under the personal supervision of Mr. Fritz. The building is equipped with a general testing section for testing iron and steel, a cement and concrete section, and a hydraulic section. The

equipment is used by the Civil Engineering Department in connection with courses in Mechanics of Materials, Hydraulics, and Cement and Concrete.

The building is of modern steel frame construction, 94 feet wide and 115 feet long, with the main central section 65 feet in height, and two side sections of lesser height. The external walls which enclose the steel frame are of cement brick lined on the inside with red brick. A traveling crane, of 10-ton capacity, operated by electricity, commands the entire central portion of the building in which the testing of large specimens is carried on.

The general testing section is equipped with an 800,000-pound Riehle vertical screw testing machine, capable of testing columns 25 feet long or less, tensile specimens 20 feet long or less, and transverse specimens up to lengths of 30 feet; an Olsen universal testing machine of 300,000 pounds capacity; smaller machines for ordinary tension, compression, transverse, and torsion tests; a cold-bend testing machine, and a small machine shop. The hydraulic section occupies the east end of the main room and is equipped with various tanks, weirs, pumps, and other apparatus for studying problems in hydraulics. The cement and concrete section has a large room for the making and testing of specimens and a room for the storage of materials.

THE ECKLEY B. COXE MINING LABORATORY

The Eckley B. Coxe Mining Laboratory is a building of dressed sandstone 100 feet long by 75 feet deep, and is occupied exclusively by the Department of Mining Engineering.

The main part of the building contains the Ore Dressing and Coal Preparation Laboratory; the west wing contains a chemical, fuel, and assay laboratory equipped for research, a balance room, a sampling and ore testing laboratory; the east wing contains the office, a recitation room, and an instrument room. A locker and wash room is located in the basement of the east wing.

The equipment for the main laboratory consists of a gyratory crusher, rolls, screens, ore and coal jigs, roller mill, classifiers, concentrators (tables and vanner), gravity stamps,

amalgamating plates, grinding pan, with the necessary apparatus, including grizzly, elevators, feeders, sand-pumps, settling tanks, dryers, and electric motors. The sampling laboratory contains a small jaw crusher, a small gyratory crusher, rolls, sample grinder, two magnetic separators, screening and sampling equipment, and a small Dorr bowl classifier. The ore testing equipment comprises a Denver Laboratory "Sub-A" Flotation (Fahrenwald) Machine; a Denver Laboratory Jig; and a Ruth Rod Mill.

The machinery is driven by separate motors, and any one part or all of it can be operated at will, permitting experimental studies and tests of individual machines or groups of machines, or of an entire process, as occasion may require. The entire plant is thus flexible and enables combinations of processes in order to determine the best method to pursue in the treatment of ores, by coarse and fine concentration, and in the preparation of coals by tables, washing, and sand flotation.

Owing to the prominence which flotation methods have assumed in concentration, a special department of the main laboratory has been equipped for this work, and several types of testing machines have been installed, including a Chance Coal Cleaner, together with the necessary equipment of motors, air compressors, etc., for their operation.

The laboratory also contains the following equipment: large and small Ingersoll-Rand rock drills, Stoper and Jackhammer drills, an Ingersoll-Rand pick machine for coal mining, a Water-Leyner rock drill, a Sullivan hand-power diamond drill, and a Temple-Ingersoll electric-air drill.

The laboratory was named by the Trustees of the University The Eckley B. Coxe Mining Laboratory in memory of Eckley B. Coxe, who was a pioneer and a leader in the profession of mining engineering in this country, and an active friend and valued Trustee of the University from its early days until his death.

CHRISTMAS-SAUCON HALL

During the summer of 1926, Christmas and Saucon Halls were remodelled and joined by the addition of a four-story central building.

Christmas Hall has historic interest as the first building of Lehigh University. It was originally a church, which was purchased from the Moravian Congregation. In the earliest years of the University it contained a chapel, lecture rooms, and students' dormitory. After Packer Hall was completed in 1869, Christmas Hall and Saucon Hall were utilized as students' dormitories and mess hall up to 1886. For many years thereafter Christmas Hall was used by the Departments of Latin, Greek, and Modern Languages, and Saucon Hall by the Department of English.

Christmas-Saucon Hall contains the office of the College of Business Administration, the offices, lecture rooms, and recitation rooms of the Departments of English and of Economics, Sociology, and Business Administration, and the offices and dispensary of the Students' Health Service.

COPPEE HALL

Coppée Hall, formerly the Gymnasium, was completely renovated in 1913 to adapt it to the needs of the College of Arts and Science. On the first floor are the offices of the College of Arts and Science and a lecture room, the office, and recitation rooms of the Department of German. On the second and third floors are the offices and recitation rooms of the Departments of Latin, Greek, Romance Languages, History and Government, and Fine Arts.

SAYRE OBSERVATORY

By the liberality of the late Robert H. Sayre, one of the Trustees of the University, an Astronomical Observatory was erected on the University grounds and placed under the charge of the Professor of Mathematics and Astronomy.

The Observatory contains an equatorial telescope by Alvin Clark, of six inches clear aperture and of eight feet focus; a modern zenith telescope of four and one-half inches clear aperture; a superior astronomical clock, by William Bond & Son; a meridian circle; a prismatic sextant, by Pistor and Martins; an engineer's transit and a sextant, by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the Observatory stands, consisting of seven acres adjoining the original grant, was presented to the University by the late Charles Brodhead, of Bethlehem.

THE PACKER MEMORIAL CHURCH

The Packer Memorial Church, in which daily chapel exercises are held, was the gift of the late Mrs. Mary Packer Cummings, daughter of the Founder of the University. It was built in 1887.

THE UNIVERSITY LIBRARY

The original Library building was erected by the Founder of the University in 1877 as a memorial to his daughter, Mrs. Lucy Packer Linderman. Work was begun in September, 1928, on an addition which will greatly enlarge the library facilities. The addition constructed on three sides of the present building will be in the collegiate Gothic style of architecture. When completed the building as a whole will contain five times the floor space of the old structure and will afford shelving capacity for approximately five hundred thousand volumes. Space will be provided in the reading room and seminars and other special rooms for about five hundred readers. Adequate space for the catalogueing departments and other purely administrative functions of the library are provided, together with special rooms for the treasure collection, the Lehigh collection, the geography collection, and the art collection. Eleven seminar rooms are provided for advanced study. The west wing will contain a browsing room and an art gallery. Small individual cubicles are provided in the stacks for advanced students and research workers.

One hundred and seventy-nine thousand volumes are now upon the shelves. The list of current periodicals numbers about seven hundred. The Library is especially rich, for one of its size, in materials for research in history, American newspapers, and the history of early science, and in files of technical journals.

Small working reference collections for laboratory use are maintained by the departments of Biology, Geology, Chemical, Civil, Mechanical, and Mining Engineering.

The Library is open from 8 a.m. to 10 p.m., except on Sundays and holidays.

The use of the Library, with privilege of borrowing books, is offered to all members of the University: faculty, stu-

dents, and alumni. Students are allowed free access to the books and are encouraged to become familiar with methods of using a library for literary and scientific work. The privileges of the Library are also extended to all qualified residents of the city. The Library offers its services to the industries located in the community.

The Eckley B. Coxe Memorial Collection

In memory of Eckley B. Coxe, for many years a Trustee of the University, Mrs. Coxe presented to the University his technical library, consisting of 7727 volumes and 3429 pamphlets. As the working library of a man who was remarkable for the extent and thoroughness of his acquaintance with the whole field of applied science, this collection possesses great value for scientific and engineering students.

The Joseph W. Richards Collection

The Joseph W. Richards Library of Metallurgy and Chemistry, consisting of about 3000 volumes, is located on the second floor of Williams Hall, and is open for use under the supervision of the Department of Metallurgy.

TAYLOR HALL

Taylor Hall, the gift of Mr. Andrew Carnegie, is a commodious concrete dormitory situated in the University Park, south of Packer Hall. It accommodates 137 students. There are suites of three rooms (a study and two adjacent bedrooms), for two occupants, and a few single rooms. The building was named Taylor Hall by Mr. Carnegie in honor of Mr. Charles L. Taylor, his former partner in business, a graduate of the University in the Class of 1876, and a Trustee of the University. The rates for the suites of rooms are $100.00 or $120.00 a year for each occupant. The single rooms are $50.00, $65.00, or $80.00 a year.

PRICE HALL

Price Hall furnishes dormitory accommodation for thirty-four students. It was named in honor of Dr. Henry R. Price, an alumnus of the University of the Class of 1870, late President of the Board of Trustees.

DROWN MEMORIAL HALL

Drown Memorial Hall is a memorial to the late Thomas Messinger Drown, LL.D., President of the University from 1895 to 1904. The building was erected by his friends and the alumni of the University and is devoted to the social interests of the University students. It contains study, reading, and lounging rooms, an assembly hall, and the offices of the Lehigh University Union, the Bureau of Student Employment and Housing, the Board of Control of Athletics, the college publications, and the dramatic and musical organizations. A cafeteria is located in the basement.

LEHIGH ALUMNI MEMORIAL BUILDING

The Alumni Memorial Building, completed and occupied in the fall of 1924, stands as a memorial to the more than 1900 Lehigh men who served in the World War, and especially in memory of the forty-six who gave their lives. The cost of erection was raised by subscription from about 1700 alumni. It is used as the administration building of the University. The Memorial Hall beneath the great tower contains the records in bronze of the Lehigh men who served and those who died, together with mementos of the War.

In the south wing of the building are the offices of the President, the Dean, and the Registrar of the University. There is also a large faculty committee room in this wing. The north wing contains the offices of the Vice-President and Comptroller, the Treasurer, and the Bursar, the offices of the Alumni Association, the University Supply Bureau, also a large room used for faculty meetings, receptions, dances, the annual meeting of the Alumni Association, and meetings of the Alumni Council.

Not only was this building made possible by alumni gifts and built under their supervision, but the architects were Lehigh men: J. L. Burley, '94, and T. C. Visscher, '99.

TAYLOR GYMNASIUM AND FIELD HOUSE

In 1913 Mr. Charles L. Taylor, a graduate of the University of the Class of 1876 and a member of the Board of Trustees, donated to the University the funds required for the erection of a gymnasium and a field house.

Taylor Gymnasium is situated at the extreme east end of the grounds of the University, adjoining the athletic field.

The building is 222 feet long by 73 feet wide. On the ground floor at the north end is located the game room, 93 by 70 feet, used for basketball and wrestling. The game room is surrounded by a gallery for spectators. The main gymnasium floor measures 90 by 70 feet. Other rooms in Taylor Gymnasium are the offices and measuring room of the Department of Physical Education, a large trophy room, basketball and handball courts, fencing, boxing, and wrestling rooms, and locker rooms with accommodations for the entire student body.

The gymnasium is equipped with all modern appliances for recreative and corrective exercises, also with apparatus for calisthenics and other gymnastics, both for individual and for class work.

In addition to numerous hot and cold shower baths, adjoining the locker rooms is a swimming pool, 75 by 25 feet, with a depth from 4½ feet to 9½ feet. The capacity of the swimming pool is 95,000 galloms.

Adjoining the gymnasium and the stadium is the Taylor field house. It is two stories in height, and has dressing rooms, lockers, and shower baths for visiting and Lehigh teams, and also rooms for medical attention to athletes.

TAYLOR FIELD

An athletic field of more than nine acres in area is provided by the University for the accommodation of students who participate in the various outdoor sports. The Stadium, located on the north side, or lower level, provides football and baseball fields. It is surrounded by concrete stands having a seating capacity for more than 12,000 spectators. On the upper level there are practice fields for football, baseball, lacrosse, and soccer; also a quarter mile track and a 220-yards straightaway, furnishing ample room for exercise by the entire student body. During the winter months a wooden outdoor running track, twelve laps to the mile, is provided.

LEHIGH FIELD

An additional athletic field of ten acres in area, with field house and covered grandstand, located about a mile from the University campus, was acquired in 1925.

ARMORY

During the summer of 1926 the building originally erected as the University Commons was thoroughly renovated to adapt it to the needs of the Department of Military Science and Tactics. The building contains the offices, class rooms, storage rooms, and indoor rifle and pistol range of that department.

THE JAMES WARD PACKARD LABORATORY OF ELECTRICAL AND MECHANICAL ENGINEERING

James Ward Packard, who was graduated from Lehigh University in 1884 with the degree of Mechanical Engineer, the designer of the first Packard motor car, the founder of the Packard Motor Car Company of Detroit, Michigan, and of the Packard Electric Company of Warren, Ohio, donated one million, two hundred thousand dollars for the erection and equipment of an electrical and mechanical engineering laboratory.

The Packard Laboratory, occupied in the fall of 1929, is approximately 225 feet long by 180 feet deep and five stories high. It is a steel framed building faced with native limestone and decorated with Indiana limestone trim. The lobby is finished in Italian travertine. The halls throughout the building are wainscoted with Tennessee marble. An auditorium on the first floor with a seating capacity of 622 is equipped with moving picture machine and projection lantern.

The western half of the James Ward Packard Laboratory, containing approximately 160,000 square feet of useful floor space, is devoted to the work of the department of Electrical Engineering. The first floor contains the departmental substation, transformer, and switch vaults for the electric power service of the building. The service machinery for the laboratory consists of a 150-Kv-a. motor-generator set and a 50-Kv-a. synchronous converter for direct-current supply, a 320-amp.-hr, 220-volt storage battery with its charging boosters, a 50-Kv-a. low frequency three-phase motor-generator set, and the necessary complement of switchboards, located in the substation. This floor also contains a large space for the installation of heavy apparatus, a transients laboratory equipped with oscillographs and dark room, a special machinery laboratory, two research rooms, instrument room, store room, and students' locker room.

The main dynamo laboratory on the second floor provides for thirty-eight working stations, each equipped with a flexible means of current supply from conveniently located plug boards. This laboratory is fitted with a large variety of d-c. and a-c. machinery and transformers, together with loading rheostats and control apparatus. A 10-ton overhead crane serves this laboratory. Adjoining the main laboratory is an instrument room and two mechanicians' shops. The second floor also includes a large measurements laboratory, two rooms for calibration and standards, two research rooms, a lecture room, a students' smoking room, and a large check room for use in connection with the auditorium.

The third floor contains the Electrical Engineering Department headquarters, a staff conference room, the William Esty Memorial Library and Reading Room, four offices, two recitation rooms, a coat room, a large computing room, and an instrument room. One part of the balcony completely surrounding the main laboratory is used for students' thesis work. Another part of this balcony is used to house an electrical museum and to display exhibits provided by manufacturing companies and others.

The fourth floor, devoted largely to class work, contains five recitation rooms, a computing room, a large lecture room, two apparatus rooms, four offices, and a coat room.

The fifth floor, which is devoted largely to work in electric communication, contains two large laboratories for course work and one laboratory for research. This floor also contains a recitation room and two instructors' offices. The two sixty-foot radio masts equipped for raising different types of antennae are conveniently located with respect to this floor.

Other conveniences serving this part of the building are an automatic passenger and freight elevator running from the first to the fifth floor and a dumb-waiter for the delivery of instruments to the various floors.

The eastern half of the building houses the department of Mechanical Engineering with offices, drawing rooms, class rooms, research rooms, reading and study room, shops, instrument rooms, and laboratories.

On the ground floor are located the store rooms, the refrigeration laboratory, the internal combustion engine laboratory, and the condensers, pumps, etc., which serve as auxiliaries for the main laboratory located on the second floor. The third floor of the laboratory wing is built as a gallery carrying an overhead crane and providing floor space for exhibits, models, and equipment of lighter weight. All the laboratories are or will be equipped with representative types of modern mechanical laboratory apparatus and instruments.

SAYRE PARK

A development of the mountain side of the University grounds was effected through the donation to the University in 1909 of the sum of $100,000.00 by the children of the late Robert H. Sayre, to be applied and used in the development of Sayre Park as a memorial to their father. Mr. Sayre was a Trustee of the University from its foundation in 1866 to his death in 1907. He was for many years President of the Board of Trustees and Chairman of the Executive Committee of the Board.

THE ARBORETUM

The Arboretum is a tract of about eleven acres added in 1909 to the upper end of Sayre Park. It was established by a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees, and of cultivating trees and shrubs for the beautifying of the Park. All of the more important species of North American trees are to be found in the University Park and the Arboretum. Adjoining the Arboretum a tract of seven acres has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

SCHOLARSHIPS, FELLOWSHIPS, AND PRIZES

UNIVERSITY SCHOLARSHIPS

The following scholarships are awarded annually:

1. Six free and ten deferred tuition scholarships to freshmen students, each of whom must present to the Committee on Scholarships and Loans satisfactory evidence that

(a) He is in need of financial assistance;

(b) He attained an average scholastic record which placed him in the highest third of his class in the high school or preparatory school from which he was graduated;

(c) His character and personality are such as to give promise that he will profit by a college education.

2. Eighteen free and thirty deferred tuition scholarships to students above the grade of freshmen, each of whom has completed at least one full year's work at the University and can present to the Committee on Scholarships and Loans satisfactory evidence that

(a) He is in need of financial assistance;

(b) During the previous academic year he has secured an average grade of C (approximately 10% above the passing grade) in academic subjects, i.e., subjects other than physical education and chapel.

(c) His character and personality are such that the University may properly assist him to complete his education.

3. Thirty-six deferred tuition scholarships to students in any class at the discretion of the Committee on Scholarships and Loans. These scholarships are subject to the foregoing requirements.

In no case is a scholarship awarded for more than one academic year in advance. Reàppointments are subject to the foregoing regulations.

In connection with the administration of the deferred tuition scholarships, interest on the notes given in lieu of tuition is charged at the rate of 6% per annum beginning on the day the student is graduated or otherwise withdraws from the University.

Payment of deferred tuition is made in monthly instalments beginning three months after a student's graduation or withdrawal from the University, at the rate of $15.00 per month during the first year and $20.00 per month thereafter.

Applications for scholarships are regularly considered by the Committee on Scholarships and Loans on July first of each year. Applicants for freshman scholarships must submit, prior to July first, records of their academic work and statements from the principals of the schools they have attended concerning their relative class standing.

FINANCIAL AID

A student who gives satisfactory evidence of his inability to pay his expenses may apply for aid from the loan funds of the University. A student to whom a loan is granted gives a note endorsed by his parent or guardian, bearing interest at the legal rate from the date of the loan, and payable at some fixed date as agreed upon. The granting of a loan is based on a knowledge of the needs of each applicant; the decision in each case is determined by all available information, and such information is treated as confidential.

The Committee on Scholarships and Loans must be thoroughly convinced of the student's inability to pay his expenses; if it is found that an application is made as a matter of convenience to avoid the necessity of earnest effort on the part of the applicant or of his parents to obtain the necessary money from relatives or friends or from a bank, the Committee will consider such information as ground for the refusal of a loan.

The Committee may at any time require from a student to whom a loan is granted a statement of his expenses while at the University. Expenditures above what is necessary for books, instruments, and laboratory fees, and for suitable but inexpensive board and lodging, will be considered as evidence that the student's circumstances are not in accord with his statement that it is impossible for himself or his parents to pay or provide for his expenses.

A loan is granted, as a rule, only to a student who has made a good record in the University. A loan is not ordinarily granted to a student during his first year of attendance.

ENDOWED SCHOLARSHIPS AND FELLOWSHIPS

Undergraduate scholarships named to honor an individual or corporation may be established in perpetuity through the payment to the Board of Trustees of Lehigh University of $10,000.00. The income from this donation will be paid to the holder of the scholarship to be applied towards the payment of University fees. The University will not, however, guarantee that this income will be forever sufficient to pay such fees in full.

Research fellowships named in honor of an individual or a corporation offering opportunities for graduate work and training in research in any designated field of study may be established in perpetuity through the payment to the Board of Trustees of $20,000.00. The income from this fund will be paid to the holder of the fellowship after the deduction of his tuition and laboratory fees. If a bequest for the establishment of a fellowship provides for half-time service as a research assistant in the Institute of Research, the remaining time to be devoted to graduate study, the University will remit the tuition fee and make only such charges against the fund as are necessary to cover the cost of materials, supplies, and apparatus that need to be provided for the work of the fellow.

THE WILBUR SCHOLARSHIP

The Wilbur Scholarship was founded in 1872 by the late E. P. Wilbur and provides the sum of $200.00 awarded annually to the student in the sophomore class having the best record.

THE HENRY S. HAINES MEMORIAL SCHOLARSHIP

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of $200.00 as a memorial to her son, Henry Stevens Haines, M.E., a member of the class of 1887. By terms of the bequest this scholarship is awarded to a student in the curriculum in Mechanical Engineering. The requirements governing the award of University scholarships apply likewise to this scholarship.

THE FRED. MERCUR MEMORIAL FUND SCHOLARSHIPS

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial of their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the Trustees of the University a fund called The Fred. Mercur Memorial Fund. The income from this fund, amounting to $600.00, is annually awarded to students of the University.

THE ECKLEY B. COXE MEMORIAL FUND

In memory of the late Eckley B. Coxe, Trustee of the University, Mrs. Coxe established a fund, now amounting to $66,497.87, the interest of which is used, under the direction of the Trustees of the University, and subject to such regulations as they may adopt, for the assistance of worthy students requiring financial aid.

THE FRANK WILLIAMS FUND

Frank Williams, E.M., of Johnstown, Pa., a graduate of the curriculum in Mining and Metallurgy of the Class of 1887, who died in October, 1900, bequeathed to the University the greater part of his estate to found a fund, now amounting to $157,380.75, the income of which is lent to deserving students.

NEW JERSEY ZINC COMPANY RESEARCH FELLOWSHIP

The New Jersey Zinc Company provided funds in 1924 for a research fellowship to be known as The New Jersey Zinc Company Research Fellowship, which is administered under the following regulations:

Appointment to this fellowship is for the period of two academic years, beginning September 1 and ending June 30, with an annual stipend of $600.00 payable in ten installments, and freedom from University fees, except the matriculation fee and the graduation fee. Half of the time of the holder of this fellowship must be devoted to research work in the department to which he is assigned; the other half to graduate study leading to a Master's degree at the end of the two year appointment providing all University requirements for this degree have been satisfied.

Applications for appointment to the New Jersey Zinc Company Research Fellowship may be submitted by graduates in engineering or science of colleges, universities, and technical schools whose requirements for graduation are substantially the same as those at Lehigh University. Applications should be sent to the President of Lehigh University, Bethlehem, Pa., on or before March 1. Each application for this fellowship should be accompanied by a catalogue of the institution from which the applicant was graduated, a certificate of his college work, a statement concerning his

practical experience, and any other evidence of his qualifications for the position which he may choose to submit. The applicant must indicate the line of graduate study he desires to undertake and his special qualifications for such work.

The holder of this fellowship is required to devote approximately ninety hours a month independently of University holidays to research work assigned to him in the department to which he is attached; he is not permitted to accept any kind of employment for pay during either ten month period of his appointment.

THE HENRY MARISON BYLLESBY MEMORIAL RESEARCH FELLOWSHIPS

In 1926 Mrs. H. M. Byllesby, widow of Col. H. M. Byllesby, M.E., '75, President of the Byllesby Engineering and Management Corporation, provided an endowment fund for the establishment of the Henry Marison Byllesby Memorial Research Fellowships in Engineering. The income provides for two fellowships which carry an annual stipend of $750.00, payable in ten monthly installments, and freedom from University fees except the matriculation fee and the graduation fee.

Appointments are for two collegiate years. Half of the time of the holders of these fellowships must be devoted to research work on some problem in electrical, mechanical, or hydraulic engineering, proposed by the President of the Byllesby Engineering and Management Corporation and approved by the Lehigh Institute of Research; the other half to graduate study leading to the degree of Master of Science at the end of the two year appointment, provided that all the University requirements for this degree have been satisfied.

THE JAMES WARD PACKARD RESEARCH FELLOWSHIP IN ELECTRICAL OR MECHANICAL ENGINEERING

The income from a bequest from James Ward Packard, Lehigh, '84, has been set aside by the Board of Trustees for a research fellowship in either Electrical or Mechanical Engineering, with an annual stipend of $750.00 for each of two years of ten months covered by an appointment.

THE C. KEMBLE BALDWIN RESEARCH FELLOWSHIP IN AERONAUTIC ENGINEERING

A fund provided by Mrs. C. Kemble Baldwin as a memorial to her husband provides for the occasional appointment of a research fellow in any branch of science having a bearing on the field of aeronautics, with a stipend of $750.00 a year for each of two years of ten months covered by an appointment.

THE BARRETT LEATHER COMPANY RESEARCH FELLOWSHIP IN LEATHER TECHNOLOGY

The Barrett Leather Company, of Newark, N. J., has established a research fellowship in leather technology for the term of two years beginning July 1, 1929, with an annual stipend of $750.00 for each of the two years covered by the appointment.

THE HUNT-RANKIN LEATHER COMPANY RESEARCH FELLOWSHIP IN LEATHER TECHNOLOGY

The Hunt-Rankin Leather Company has established a research fellowship in leather technology for the term of one year beginning July 1, 1929, with a stipend of $1,800.00 payable in twelve installments.

THE COLUMBIAN CARBON RESEARCH FELLOWSHIP

The Columbian Carbon Research Fellowship for the promotion of research in Chemistry is the gift of the L. Martin Company of New York, N.Y. This fellowship carries an annual stipend of $1,600.00, payable in twelve installments.

THE R. K. LAROS SILK COMPANY RESEARCH FELLOWSHIP

The R. K. Laros Silk Company Research Fellowship for the promotion of research in silk and the fabrication of silk textiles is the gift of the R. K. Laros Silk Company of Bethlehem, Pa. This fellowship carries an annual stipend of $750.00, payable in ten installments.

THE ARCHER-DANIELS-MIDLAND COMPANY AND THE WILLIAM O. GOODRICH COMPANY RESEARCH FELLOWSHIPS

Three fellowships, carrying an annual stipend of $900.00 each, were established in the fall of 1927 by the Archer-Daniels-Midland Company, of Minneapolis, Minn., and the William O. Goodrich Company, of Milwaukee, Wis., for research in linseed and other drying oils.

THE STUDENT CHEMISTRY FOUNDATION

In the spring of 1927 members of the Class of 1930 established the Student Chemistry Foundation in honor of Harry M. Ullmann, Head of the Department of Chemistry. This fund provides two research fellowships for Lehigh University graduates only carrying an annual stipend of $750.00 each.

THE WILBUR PRIZES

A fund was established by the late E. P. Wilbur for distribution in prizes as the Faculty shall determine. This fund yields an annual income of $100.00.

THE JOHN B. CARSON PRIZE

An annual prize of $50.00 was established in 1909 by Mrs. Helen C. Turner, of Philadelphia, Pa., in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the Civil Engineering curriculum of Lehigh University in 1876. It is awarded for the best thesis by a senior of the curriculum in Civil Engineering.

THE WILLIAM H. CHANDLER PRIZES IN CHEMISTRY

Four annual prizes of $25.00 each, one in each class, for excellence in the curricula in Chemistry and Chemical Engineering, were established in 1920 by the gift of Mrs. Mary E. Chandler, of Bethlehem, Pa., widow of Dr. William H. Chandler, who was Professor of Chemistry in Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the Faculty named the prizes "The William H. Chandler Prizes in Chemistry."

THE ELECTRICAL ENGINEERING PRIZE

An annual prize of $25.00, established by an anonymous graduate of the curriculum in Electrical Engineering, is awarded to the member of the graduating class presenting the best thesis in Electrical Engineering.

THE PHILIP FRANCIS DU PONT MEMORIAL THESIS PRIZE IN ELECTRICAL ENGINEERING

The Philip Francis du Pont Memorial Thesis Prize Fund was established in 1929 by L. S. Horner, E.E., '98. The annual income of this fund, $150.00, is awarded each year as two prizes of $100.00 and $50.00 for the best senior thesis in Electrical Engineering. The subject for 1929-

1931 is: "Correction of power factor on an induction motor used as an individual drive on any type of machine tool designed to produce a metal part or piece, by the use of a static condenser, to raise efficiency, provide more uniform speed, etc." If any year no thesis submitted is, in the opinion of the Head of the Department of Electrical Engineering, worthy of the award, the income of the fund is accumulated and added to the succeeding year's award.

ALUMNI PRIZES

By a resolution of the Alumni Association of September 21, 1900, the Alumni Scholarship Fund, which was originally designed to help poor students, was, with the consent of the contributors, diverted from this purpose and the income devoted to prizes to members of the junior class. In 1929 two prizes of $25.00 each were awarded to the first honor men of the curricula in Industrial Engineering and Civil Engineering. In subsequent years the prizes will be awarded to the first honor men of the technical curricula in turn.

ALUMNI PRIZES IN PUBLIC SPEAKING

The Alumni Association of Lehigh University established in 1882 annual prizes for excellence in oratory, amounting to $50.00. The amount of these prizes was in 1926 increased to $100.00 for excellence in public speaking. The prize speaking contest is governed by the following regulations:

1. The contest shall be held on February 22, or on the day designated by the University to commemorate the birth of Washington.

2. There shall be six prizes: one first prize of $25.00, one second prize of $15.00, one third prize of $10.00, in each of two separate groups, (1) Arts and Science, and Business Administration students, (2) Engineering students.

3. The contest shall be open to any student not a freshman who is in good standing and who has completed acceptably some course in public speaking at Lehigh University.

4. Candidates shall declare their intention of entering the contest by December 1 and shall by January 5 submit an original written speech of about 1,500 words on some topic of their own choice, the thought of which can be made the basis of an eight minute speech in the final oral contest.

The three men in each group of candidates, whose written speeches shall rank highest in excellence of thought and literary form, and whose work in public speaking has been satisfactory, shall become the six final contestants.

5. The Directors of the Alumni Association or such committee as they shall appoint shall act as judges of the contest and by majority vote make the awards.

6. In awarding the prizes the judges shall give equal weight to thought and delivery.

7. These rules are subject to amendment jointly by the Faculty and the Alumni Association.

THE WILLIAMS PRIZES IN ENGLISH

Professor Edward H. Williams, jr., an alumnus of the University of the Class of 1875, established in February, 1900, prizes for excellence in English Composition and Public Speaking. The freshman, sophomore, and junior prizes are awarded by the Faculty on the recommendation of the Department of English.

Freshman Oral Composition Prizes. A first prize of $40.00 and a second prize of $15.00 are awarded to freshmen of regular standing who excel in the oral composition contest held in May of each year.

Sophomore Composition Prizes. A first prize of $50.00, a second prize of $25.00, and a third prize of $15.00, are awarded annually for the three best compositions submitted by sophomores of regular standing as required work in their English courses.

Junior Composition Prizes. A first prize of $40.00 and a second prize of $15.00 are awarded for the two best essays submitted by juniors to the Department of English as part of the required work of their English courses.

Senior Prizes. The senior prizes are awarded by the Faculty on recommendation of the Committee on Williams Senior Prizes.

1. Senior prizes of $75.00 (first prize) and $25.00 (second prize) are awarded annually by each of the three Departments of Economics, English, and Philosophy and Psychology for dissertations submitted by regular members of the senior class on or before May 1st.

2. The Committee on Williams Senior Prizes publishes before the close of the University year a list of recommended subjects for dissertations, but a senior may submit a dissertation upon any other subject in the respective fields if the subject has received the approval of the Committee.

3. Every senior entering the competition shall submit to the Committee his choice of subject and plan of work by December 1st.

4. The awards will be made by the Faculty upon recommendation of the Committee; but the Committee will recommend that no award be given if in any case a dissertation does not meet its standards of merit. This standard will include such points as excellence in thought, plan, development, argument, and composition.

THE FRAZIER AND RINGER MEMORIAL FUND

This is a fund for the medical and surgical care of needy students, established in memory of Benjamin West Frazier, A.M., Sc.D., former Professor of Mineralogy and Metallurgy, and Severin Ringer, U.J.D., former Professor of Modern Languages and Literature and of History, each of whom faithfully served Lehigh University for one-third of a century. The fund was started February 12, 1906, by the donation of $13,000.00 by the late Robert H. Sayre. It is hoped that this fund may, by other donations, be increased in time to amount to a sum sufficient to insure free medical and surgical attendance to all students of the University requiring such aid.

GENERAL STATEMENT

HISTORY

Lehigh University was chartered by the Legislature of Pennsylvania by an act dated February 9, 1866. In 1865 the Hon. Asa Packer, of Mauch Chunk, inaugurated a movement to provide an institution that would afford training and education in the learned professions as then recognized, and in technical branches, the importance of which was then just becoming apparent in the development of the industrial and transportation interests of the country. He made an initial donation of a large tract of land for this purpose and the sum

of $500,000.00 to which he added largely during his lifetime and by his will.

Since its foundation the equipment and resources of the University have steadily increased through the continued interest of the University's trustees, alumni, and friends. The present endowment totals $5,232,896.78. The first important addition to the University's original plant was the Sayre Observatory, donated in 1869 by Robert H. Sayre, of Bethlehem. Later donations include Packer Memorial Church, 1887; Williams Hall, 1902; Drown Memorial Hall, 1907; the Armory, 1907; the Wilbur Heating Plant and Engineering Laboratory, 1907; Taylor Hall, 1907; Sayre Park, 1909; the Coxe Mining Laboratory, 1910; the Fritz Engineering Laboratory, 1910; Taylor Gymnasium and Taylor Field, 1913; the Alumni Memorial Building, 1924; the James Ward Packard Electrical and Mechanical Laboratory, 1926; the Library Extension, 1928.

INSPECTION TRIPS

Inspection trips to industrial plants are a required part of specific courses in the various curricula in engineering. Written reports or examinations are required. These trips are under the general direction and supervision of the Faculty Committee on Inspection Trips.

GRADUATING THESES

Theses, when required, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the student's record, for future reference, but copies may be retained by students, and may be published, permission having first been obtained from the Faculty.

PLACEMENT SERVICE

The heads of the various technical curricula of the University coöperate with graduates in securing suitable professional openings. Similarly, students who desire to teach are assisted in finding positions by the Faculty Committee on Teacher Placement. Such students are put in touch, also, with the Placement Service of the Teacher Bureau of the Department of Public Instruction of Pennsylvania at Harrisburg.

STUDENTS' HEALTH SERVICE

The Students' Health Service, organized in 1923, has general charge of all health and sanitary measures in the University. The work of the department is organized under four heads: Sanitation, Physical Examinations, Dispensary Service, Education.

Sanitation. The Director of the Health Service is in direct charge of the sanitation of University buildings and grounds, and exercises such supervision as is possible over other accommodations for students.

Physical Examinations. Each student is required to undergo a complete physical examination each year. This examination, which is made jointly by the Health Service and the Department of Physical Education, serves the needs of both these departments and also complies with the requirements of the Reserve Officers' Training Corps. All physical defects and departures from normal are noted, and the students are divided into groups as follows: (1) those who present no abnormalities and who can proceed with the regular mental and physical work of the University, (2) those who are abnormal or sub-normal, but who should be brought up to normal by the regular courses in Physical Education, (3) those who require special or corrective measures.

Those students who fall into groups 2 and 3 are observed at regular intervals, and every effort is made to bring them up to the highest degree of physical development and health. Individual records are kept of the progress of each case.

Dispensary Service. The Health Service maintains a dispensary in Saucon Hall where students may receive free treatment for minor illnesses and injuries. The Dispensary hours are from 8.30 to 12.00 a.m. on all week days, from 1.30 to 5.00 p.m. on week days except Saturday, and from 10.00 to 12.00 a.m. on Sunday. A physician and a nurse are on duty in the dispensary during these hours. While the Health Service does not furnish medical attendance to students who are sick in their rooms, the Director keeps in touch with such cases by telephone and otherwise in so far as is possible in order to see that the students are receiving proper attention and that the time lost from University work is minimized. It is requested

that all such cases, together with the names of the attending physicians, be reported to the Director in order that complete records of the health of the students may be kept.

Education. A course in Personal and Social Hygiene is given to freshmen by the Director of the Health Service in conjunction with the Departments of Biology and Physical Education. In this course emphasis is laid on those points of personal hygiene most applicable to the student recently deprived of the atmosphere and influences of home. In social hygiene an effort is made to disseminate correct information concerning the history and present status of social diseases and the effectiveness of approved methods for the relief of existing conditions. This phase of the Health Service constitutes a specific part of the general program of instruction recommended by the State Board of Health and by other recognized organizations for the promotion of social hygiene.

BUREAU OF STUDENT EMPLOYMENT AND HOUSING

The Bureau of Student Employment and Housing is in charge of an officer of the University who is at all times at the service of students in matters pertaining to housing and remunerative employment while the University is in session.

LEHIGH UNIVERSITY UNION

The Lehigh University Union is a voluntary organization of students for the promotion of the religious, moral, and social life of the University. The movement is distinctly for and by students, all the officers, with the exception of the General Secretary, being chosen from the student body. The office of the General Secretary is in Drown Memorial Hall.

THE LEHIGH UNIVERSITY BAND

The Band is required to participate in military ceremonies when called upon by the Professor of Military Science and Tactics, and also to attend all football games played at home and not more than ten other home games, to be specified by the Graduate Manager of Athletics.

Coat and cap of uniform, musical instruments, and music are furnished by the University. Members of the band furnish trousers. A deposit of $25.00 is required for an instrument or uniform.

Seniors and juniors who qualify for membership in the Band may substitute band work for the requirement in Physical Education; sophomores and freshmen may substitute band work for the requirements in Physical Education and in Military Science and Tactics. Credit is not given during any term for both Band and either of the above named subjects. Students desiring to play in the Band as volunteers may do so, if qualified, and are entitled to the awards named in the following paragraph.

In addition to the above credits, one year of satisfactory service in the Band entitles a student to a watch fob; two years of service, a sweater; three years, $20.00 in cash; and four years, an additional $20.00 in cash. These awards are made only to those members of the Band who maintain at least sixty per cent. attendance each term at rehearsals, military ceremonies, and college activities.

BOARD OF CONTROL OF ATHLETICS

The management of intercollegiate athletics is vested in the Board of Control of Athletics, which consists of four members of the Faculty, four alumni elected by the Directors of the Alumni Association, and four undergraduates. The Graduate Manager is the executive officer of the Board.

The membership of the Board of Control of Athletics for the year 1929-1930 is as follows:

Faculty: Professors H. R. Reiter, J. H. Ogburn, J. L. Beaver, F. M. Weida.

Alumni: Messrs. W. R. Okeson, '96; J. A. Frick, '03; D. M. Petty, '09; M. L. Jacobs, '10.

Undergraduates: Messrs. W. E. Miller, Jr., J. H. Girdler, E. F. Evers, W. G. Badgley.

The Graduate Manager of Athletics is J. G. Petrikin, '96.

HONORARY SCHOLARSHIP SOCIETIES

PHI BETA KAPPA. Students in the College of Arts and Science and the College of Business Administration who up to the middle of the senior year maintain high scholarship may be elected to membership; also a limited number of engineering students whose work in philosophical, scientific, and language studies is of high grade.

Tau Beta Pi. This national honorary society, which now has forty-one chapters, was founded at Lehigh University in 1885, under the auspices of Professor E. H. Williams, jr. Students in the College of Engineering who up to the middle of the junior year maintain high scholarship may be elected to membership.

Sigma Xi. Election to membership is based upon the completion of original and noteworthy research in pure or applied science and the publication of the results thereof. Ordinarily undergraduates are eligible to associate membership only, their election being based upon their promise of achievement in scientific research.

Eta Kappa Nu (Electrical Engineering). Students in the curriculum in Electrical Engineering who up to the middle of the senior year maintain high scholarship may be elected to membership.

Pi Tau Sigma (Mechanical Engineering). Students in the curriculum in Mechanical Engineering who up to the middle of the senior year maintain high scholarship may be elected to membership.

COURSE SOCIETIES

Intellectual interest in various fields of study and professional spirit among pre-medical, pre-legal, business, and engineering students are promoted by a group of organizations commonly called Course Societies. The first of these organizations historically was the Chemical Society, established in 1871. The list now includes:

In Arts and Science

Delta Omicron Theta (public speaking)
Deutscher Verein
Ernest W. Brown Astronomical Society
Eta Sigma Phi (classics)
International Relations Club (history and government)
Newtonian Society (mathematics)
Pi Mu Epsilon (mathematics)
Pre-Legal Society
Robert W. Blake Society (philosophy, psychology, and education)
Robert W. Hall Pre-Medical Society

In Business Administration

Alpha Kappa Psi (professional business fraternity)

In Engineering

Chemical Society
Civil Engineering Society (student branch of the A. S. C. E.)
Electrical Engineering Society (student branch of the A. I. E. E.)
Industrial Engineering Society
Mechanical Engineering Society (student branch of the A. S. M. E.)
Metallurgical Society
Mining and Geological Society
Radio Club.

OTHER ORGANIZATIONS

Other student organizations include:

Arcadia (student self-government council)
Lehigh Union (general students' social organization)
Interfraternity Council
Omicron Delta Kappa (senior honorary fraternity)
Sword and Crescent (senior honorary society)
Cyanide Club (junior honorary society)
Phi Club (sophomore honorary society)
Scimitar (sophomore honorary society)
Pi Delta Epsilon (honorary journalistic fraternity)
Scabbard and Blade (honorary military fraternity)
Spiked Shoe (honorary fraternity, track athletics)
Mustard and Cheese (dramatic club)
Combined Musical clubs
Lehigh Band
Fencing Club
St. Paul's Society (Episcopalian club)
Allen-Lehigh Club (Lehigh students resident in Allentown).

The following Greek letter fraternities have chapters at Lehigh University: Alpha Chi Rho, Alpha Tau Omega, Beta Theta Pi, Chi Phi, Chi Psi, Delta Phi, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Omega Phi Sigma (local), Phi Beta Delta, Phi Delta Pi (local), Phi Delta Theta, Phi Gamma Delta, Phi Sigma Delta, Phi Sigma Kappa, Pi Kappa Alpha, Pi Lambda Phi, Psi Upsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi, Sigma

Phi Epsilon, Tau Delta Phi, Theta Delta Chi, Theta Kappa Phi, Theta Xi.

STUDENT PUBLICATIONS

The students of Lehigh University publish a semi-weekly college newspaper, *The Lehigh Brown and White;* a quarterly magazine, *The Lehigh Review;* a comic monthly, *The Lehigh Burr;* and a year-book, *The Epitome.*

FOUNDER'S DAY

The second Wednesday following the opening of the University in each year is celebrated as Founder's Day in honor of the Founder of the University, Asa Packer. Degrees are conferred and freshman and sophomore honors and prizes are announced.

At the exercises on October 2, 1929, the fiftieth Founder's Day, an address entitled "Melioration by Matter" was delivered by Willis Rodney Whitney, Ph.D., D.Sc., D.Ch., Vice-President and Director of the Research Laboratories, General Electric Company.

UNIVERSITY SUNDAY

The Sunday preceding University Day is known as University Sunday, and is devoted to the Baccalaureate Service. The Baccalaureate Sermon on June 2, 1929, was preached by the Rt. Rev. Charles Fiske, D.D., LL.D., Bishop of the Diocese of Central New York.

UNIVERSITY DAY

University Day marks the close of the collegiate year. On this day the graduation exercises are held, an address is given, senior honors and prizes are announced, and degrees are conferred.

The address at the exercises on June 11, 1929, was given by the Rev. Harry Emerson Fosdick, D.D., LL.D., of New York, N.Y. The award of commissions in the Officers' Reserve Corps was made by Lieutenant Colonel Edward Eugene McCammon, Head of the Department of Military Science and Tactics.

THE ALUMNI ASSOCIATION

The Alumni Association, which has been in existence since 1876, was incorporated in 1917 under the name The Alumni Association of the Lehigh University, Inc. The offices of the

Association are in the Alumni Memorial Building. The Secretary is a permanent salaried officer. He edits the *Lehigh Alumni Bulletin*, a news publication issued monthly from October to July, inclusive, and the *Directory of Alumni and Students*. The Association is largely concerned with raising money to meet the needs of the University.

The officers and directors of the Alumni Association for 1929-1930 are:

President, A. R. Glancy, '03, of Detroit, Mich.

Vice-President, R. P. Hutchinson, '04, of Bethlehem, Pa.

Vice-President, E. F. Johnson, '07, of Detroit, Mich.

Treasurer, R. S. Taylor, '95, of Bethlehem, Pa.

Secretary, A. E. Buchanan, Jr., '18, of Bethlehem, Pa.

Archivist, J. L. Beaver, '04, of Bethlehem, Pa.

Honorary Alumni Trustees: Henry D. Wilson, '01, of Pittsburgh, Pa.; Aubrey Weymouth, '94, of New York, N. Y.; Clarence W. Hudson, '89, of New York, N. Y.; Cadwallader Evans, Jr., '01, of Scranton, Pa.; F. R. Dravo, '87, of Pittsburgh, Pa.; and T. M. Girdler, '01, of Cleveland, O.

The following are the local alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington Lehigh Club, Detroit Lehigh Club, Cincinnati Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Lehigh Club of New England (Boston, Mass.), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N. Y.), Lehigh Club of Northern Ohio (Cleveland, O.), Lehigh Club of Southern New England (Hartford, Conn.), Lehigh Club of Western New York (Buffalo, N. Y.), Southern Anthracite Lehigh Club (Pottsville, Pa.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of China (Wuchang, China), Lehigh Club of Cuba (Havana, Cuba), Lehigh Club of Southeastern Pennsylvania (Reading, Pa.), Lehigh Club of Trenton (N. J.), Lehigh Club of York (Pa.), Lehigh Club of Northern New Jersey (Newark), Lehigh Club of Northern California (San Francisco), Lehigh Club of Southern California (Los Angeles).

DEGREES

Conferred on University Day, June 11, 1929

HONORARY DEGREES

DOCTOR OF SCIENCE

John Arthur Wilson	Milwaukee, Wis.

DOCTOR OF ENGINEERING

Robert Ridgway, A.M., M.S., C.E.	New York, N.Y.

DOCTOR OF LAWS

Henry Chapman Mercer, A.B., Sc.D.	Doylestown

DEGREES IN COURSE

MASTER OF ARTS

Merritt Weaver Brown, B.A. *(Lehigh University)*	Bethlehem
Everett Herschel Johnson, B.A. *(DePauw University)*	Westfield, Ind.

MASTER OF SCIENCE

Fayette Curtis Anderson, B.S. in E.E. *(University of Minnesota)*	Bethlehem
Leland Spencer Barnes, B.A. *(Occidental College)*	Bethlehem
Carlton Ernest Brown, Ch.E. *(Lehigh University)*	Washington, D.C.
Walter Robert Couch, C.E., M.S. *(Akron University)*	Bethlehem
Halton Hobson Friend, B.S. *(Northwestern University)*	Sand Springs, Okla.
Maurice Sven Gjesdahl, B.S. in Eng. *(University of Minnesota)*	Minneapolis, Minn.
Richard Bauman K'Burg, Ch.E. *(Lehigh University)*	Wooster, O.
William Walton Kittelberger, Ch.E. *(Lehigh University)*	Curwensville
Edward William McGovern, Ch.E. *(Lehigh University)*	Bethlehem
Fred H. Minner, B.S. *(Muhlenberg College)*	Allentown
Samuel Craig Nevins, Ch.E. *(Lehigh University)*	Tamaqua
Frederic Allen Scott, B.S. *(New York State College)*	Roslyn Heights, N.Y.
Lawrence Klindworth Scott, A.B. *(University of Kansas)*	Independence, Kans.

William Joseph Sette, B.S. *(Yale University)*	New Haven, Conn.
Wayne Treber Sproull, B.S. *(University of Akron)*	Akron, O.
John Murray Thompson, A.B. *(DePauw University)*	Kokomo, Ind.
Harold Philip Whitenight, B.S. *(Muhlenberg College)*	Allentown

BACHELOR OF ARTS

Laurence Justin Ackerman	Far Rockaway, N.Y.
John Karsten Ahlberg	Brooklyn, N.Y.
Philip Angeles, Jr.	New York, N.Y.
Edwin Brown Arnold	Pittsburgh
Edward Folsom Baker	Buffalo,, N.Y.
Edward Marvin Blanchard	Brooklyn, N.Y.
Arthur James Blythe	Clark's Summit
Marvin Sidney Borowsky	Philadelphia
Joseph Ralph Caskey	Germantown
Vincent James Cassone	Allentown
Aubrey Cresson Delaplaine, Jr.	Cynwyd
Nicholas Derrico	New York, N.Y.
†Henry Stewart Engart	Doylestown
Henry Kindt Erwin	Bethlehem
Daniel William Farnsworth	Little Falls, N.J.
Irving Leonard Finn	Asbury Park, N.J.
William Francis Flynn	Dedham, Mass.
Orville Nathaniel Greene	Bethlehem
George Wellington Hartzell	Bethlehem
Clinton Franklin Heil	Bethlehem
Harry Louis Hesse	Roselle Park, N.J.
Henry Whiting Holt	Pittsburgh
John Edward Jacobi	Bayonne, N.J.
Arthur William Kempf	Bethlehem
Arthur Clair Landis, Jr.	Hamburg, Germany
George Desmond Lange	Cape May Court House, N.J.
Arthur Lehr	Glendale, N.Y.
Herman Lehrer	New York, N.Y.
Alvin Bower Lewis	Bethlehem
Edwin Jacob Miller	Bethlehem
David Theodore Miralia	Mamaroneck, N.Y.
Paul Alfred Moser	Freemansburg
Luke Julius Nolfi	Glen Lyon
Bernard Lawton Opolinsky	Brooklyn, N.Y.
Harold Stephen Payer	McAdoo
Stanley Urmston Phares	Elizabeth, N.J.

† Diploma withheld pending completion of R. O. T. C. Camp.

Ralph Delfus Read	Akron, O.
John Chaney Reinoehl	Germantown
Harry Bauer Sames	Philadelphia
Hyman Satenstein	New York, N.Y.
Irving Hoos Schwab	Bath
Adam Edward Shekletski	Wanamie
Sydney Paul Simons	Bridgeport, Conn.
George Edgar Smith	Wyoming
Harlan Eskey Snodgrass, Jr.	Summit, N.J.
Edward George Steinmetz, Jr.	Wyncote
Richard Marvin Stone	Niagara Falls, N.Y.
Maxwell Lloyd Valeche	Brooklyn, N.Y.
Horace Valenstein	New York, N.Y.
William Arthur Weber	Scranton
Russell Mason Weierbach	Pleasant Valley
August Joseph Wiesner, Jr.	Bergenfield, N.J.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Reginald Frank Alexander	Washington, D.C.
Albert Emerson Andrew	Bethlehem
Edward Maxwell Bachtell	Hagerstown, Md.
John Edward Barnard	Meriden, Conn.
Emil George Barnhard	Girardsville
Stephen Pierce Becker	Poughkeepsie, N.Y.
Norman Frank Beer	Red Bank, N.J.
Henry Hobart Behr	Montclair, N.J.
Thomas Moran Brennan	Rockville Centre, N.Y.
Meyer Brower	Newark, N.J.
Thornton Earl Chamberlin	Buffalo, N.Y.
Joseph Guy Colclough	Catasauqua
Robert Rhodes Davis	Clarksburg, W.Va.
Clyde Donald Deitzler	Lebanon
Francis James Donnelly	Bridgeport, Conn.
Harold Charles Eschenlauer	Woodcliff, N.J.
Ward Clarke Faust	Kingston
Louis Robert Fimian	Hastings-on-Hudson, N.Y.
David Garrison Fluharty	Rockville Centre, N.Y.
Franklin Ryan Fort	East Orange, N.J.
Harry Nelson Foshay	Peekskill, N.Y.
Samuel Garwood	Medford, N.J.
Robert Rowe Hertzler	Lancaster
Carl John Heyser	Brooklyn, N.Y.
Richard Greshoff Kieffner	Washington, D.C.
John Irvine Kirkpatrick	Woodhaven, N.Y.
Thomas Baird Lewis	Kingston
Melville Norman Liberman	White Plains, N.Y.
William Park Linn	Glen Ridge, N.J.
Arthur Edward Magill	Newark, N.J.

John Howard Manley	Brooklyn, N.Y.
Wight Martindale	Glen Ridge, N.J.
Bruce Morrison	Stamford, Conn.
Charles Milton Muntrick	Newark, N.J.
Francis Palmer, Jr.	Germantown
Philip Henry Peloubet	Glen Ridge, N.J.
Richard Kenneth Pflueger	Schuylkill Haven
Thomas Edward Price	Plains
Eugene Connett Quinlan	Yonkers, N.Y.
Richard Greer Raup	Audubon, N.J.
Raymond Lecount Roper	Richmond Hill, N.Y.
Robert Buchman Sax	Philadelphia
James Edward Schaefer	Newark, N.J.
George Wallace Simrell, Jr.	Brooklyn, N.Y.
Leland Dewey Trantum	Brooklyn, N.Y.
Harry Creomer Troland	Philadelphia
Walter Scott Usher	Union City, N.J.
Paul VanWinkle	Scarsdale, N.Y.
Frederick William Whaley	Buffalo, N.Y.
Chester Mitchell Wilcox	Binghamton, N.Y.
Walter Arthur Wilson	Richmond Hill, N.Y.
Elmer Ellsworth Wyckoff, Jr.	Washington, N.J.

CHEMICAL ENGINEER

Hyman Baker	Wildwood, N.J.
Roland George Benner	Quakertown
Forest Theodore Benton, Jr.	Somerville, Mass.
Willard Marshall Brown	Wilkes-Barre
Thompson Chandler	New York, N.Y.
Michael Smyser Ebert	Wilmington, Del.
Denton Edward Fox	Reading
Henry Bateman Gans, Jr.	Uniontown
Nathaniel Rome Goldblatt	Reading
George Miller Hebbard	Washington, D.C.
William Owens Heilman	Harrisburg
Charles Ferdinand Keller	Harrisburg
Philip Kratz	Bethlehem
John Adam Lutz	Myerstown
John Alfred Lyter	Harrisburg
Edward West Midlam, Jr.	Wilmington, Del.
John Zollinger Miller	Harrisburg
Fred Claus Naylor	Bethlehem
Charles Tilghman Oswald	Fullerton
Edward Merrill Bayard Paschall	Dauphin
Reginald James Ritter	Bethlehem
Walter Henry Salzenberg	Woodcliff, N.J.
Joseph Philip Scavo	Old Forge
John Paul Sharp	Hackettstown, N.J.
Johnston Bitler Shimer	Wilmington, Del.

Reginald Frank Smith	Newport
Clement Francis Stanton	Mt. Carmel
Henry Allen Sterner	Pottsville
William John Urban	Reading
Roger Harold VanHorne	Germantown
Ralph Aloysius Visco	Wood-Ridge, N.J.
James Oscar Whitaker	Branchville, N.J.

BACHELOR OF SCIENCE IN CHEMISTRY

Harold William Lynn	Bethlehem
Emil Stein	Bethlehem

CIVIL ENGINEER

Alessio John Accardi, Jr.	Wildwood, N.J.
Ralph John Albright	Allentown
Joseph George Conrath	Erie
John Knox Covey	Coudersport
Robert DeMoyer	Camden, N.J.
Paul William Early	Reading
George Stuart Enscoe	Port Washington, N.Y.
John Powell Evans	Freeland
Harry Roosevelt Fauth	York
David Homer Fiscus	National City, Cal.
Charles Willard Granacher	Scranton
Arthur Digby Harris	Hackensack, N.J.
Henry George Augustus Hayward	Bridgeport, Conn.
Herbert Clarence Hobbs, Jr.	Brooklyn, N.Y.
Zebulon Corbin Hopkins	Dover, Del.
Joseph Edward Illick	Bethlehem
Minoru Inaba	Bethlehem
Cares Creighton Keyser	Camden, N.J.
Samuel Lewis	Allentown
Francis William McCarthy	Saint Clair
Carl Shaw Pennington	Trenton, N.J.
Ralph Cassell Rambler	West Hanover
James Bertrand Reill	Scranton
James Samuel Scandale	Old Forge
John Carl Schell	Reading
John Herbert Shartle	Lancaster
Clarence Lichty Snavely	Lancaster
Walter A. VanFleet	Somerville, N.J.
Fred Vincent Ventre	Old Forge
Earnest Judson Warlow	Baltimore, Md.
Philip Wendell Woodring	Allentown

ELECTRICAL ENGINEER

Arthur Bryant Achilles	New York, N.Y.
Luther Huyette Bender	Wernersville
William Eugene Connor	Wilkes-Barre
Moses Davis	Scranton

Henry Nelson French	Stamford, Conn.
John William Gehrke	Reading
DeWitt Cromwell Gilbert	Hackensack, N.Y.
Cecil William Guyatt	Upper Darby
Albert Adolph Hang	New York, N.Y.
George Hazlette Hartung	Phillipsburg, N.J.
Frank John Herman	Northampton
Andrew Bothwell Horgan	Orange, N.J.
Carl Henry Jenkins	Camden, N.J.
Richard Morris Kennedy	Lansford
John Richard Kostes	Shenandoah
Norman John Kramer	Rutherford Heights
Richard Charles Lambert	Bethlehem
Charles Carlton Leader	Shamokin
Russell Otterbein Lerch	Palmyra
Frederic Church Matson	Washington, D.C.
Lyman Breed Nason	Tyrone
James Walter Peters	Egypt
William Morton Pickslay, Jr.	Brooklyn, N.Y.
George Samuel Prokop	Bethlehem
Philip Henry Reeves	Wildwood, N.J.
John Hagenbuch Solt	Bethlehem
Ricardo Sosa	Salta, Argentina
Leon Knepper Sowers	Hagerstown, Md.
†Frank Wallace Stevenson, Jr.	Camden, N.J.
Roger Schofield Taylor	Conowingo, Md.
John Lincoln VanNort	Clarks Green
Daniel Caraker Vaughan	Washington, D.C.
Horace Gotwalt Wiest	York
John Edward Wightman, Jr.	Mount Carmel

BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Thomas Frank Fisher	Williamsport
John Dale Kelly	Pelham Manor, N.Y.
Kenneth Moore Simpson	Pottstown

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

Charles Sidney Alter	Pottsville
John Humphrey Crawford, Jr.	Orange, N.J.
Robert John Ellis	Newark
John Wilbur Flory	Columbus, O.
Edward Charles Gerwig, Jr.	Parkersburg, W.Va.
Edwin Hays Gott	Pittsburgh
Walter Merwyn Hand, Jr.	Culver, Ind.
Harold Theodore Krick	Hazleton
Carl Frederick Kurtz	Bethlehem
Plantou Middleton	Germantown

† Diploma withheld pending completion of R. O. T. C. Camp.

Walter Lee Miller	Wernersville
John Tolbert Neath	Haddonfield, N.J.
William Treverton Odgers	Parkersburg, W.Va.
Frederick Christian Schmid, Jr.	New York, N.Y.
Gustavus Sickles, Jr.	Newark, N.J.
Philip Marx Zimmerman	Brooklyn, N.Y.

MECHANICAL ENGINEER

William Butterworth (as of the Class of 1889).	Washington, D.C.
John Emery Beck	Bethlehem
Franklin Willard Cherry	Ringtown
Edward Max Mittendorff	Barmen, Germany
Eugene Attillio Pelizzoni	Allentown
Fulbert Culbreth Polk	Princess Anne, Md.
John Graham Reid, Jr.	Pottsville
William Edward Roberts	Slatington
Oscar Bernhardt Schier	Baltimore, Md.
Arthur Harold Serrell, Jr.	Brooklyn, N.Y.
Charles Edmunds Webbe	Summit, N.J.
Willis Theodore Yeager	Allentown

METALLURGICAL ENGINEER

Leonard Carter Crewe, Jr.	Haverford
Lars Eskil Ekholm	Malden, Mass.
Calvin Parsons Kidder	Forty Fort
Arthur Llewellyn Roberts, Jr.	Westfield, N.J.
Anton Philip Charles Schweickardt	Pittsburgh
Charles Martin Schwitter	Montclair, N.J.
Daniel Herman Wenny, Jr.	Orange, N.J.

ENGINEER OF MINES

Michael Joseph Bollman	Lebanon
Kenneth Richard Eckrote	Conyngham
Joseph Ellsworth Fopeano	Middleburg
Andrew Max Henry	Augusta, Ga.
James Mennert Newlin	Sparrows Point, Md.
Harry Otis Nutting, Jr.	Lebanon
William Joseph Pollitt	Bridgeport, Conn.
Robert Newton Pursel	Danville
Arthur Waldman	Philadelphia

COMMISSIONS AS SECOND LIEUTENANT IN THE OFFICERS' RESERVE CORPS

Infantry

Edward Maxwell Bachtell	Hagerstown, Md.
Edward Folsom Baker	Buffalo, N.Y.
Joseph Ralph Caskey	Germantown
George Howard Cross, Jr.	Swarthmore

Ralph Claire Davis	Saint Petersburg, Fla.
Ernest William Dehm	New Britain, Conn.
John David Fenner	South Orange, N.J.
Franklin Ryan Fort	East Orange, N.J.
Andrew Bothwell Horgan	Orange, N.J.
Paul Joseph Horvath	Bethlehem
John Edward Jacobi	Bayonne, N.J.
Richard Greshoff Kieffner	Washington, D.C.
Philip Kratz	Bethlehem
Arthur Clair Landis, Jr.	Hamburg, Germany
Arthur Lehr	Glendale, N.Y.
John McLachlan, Jr.	East Elmhurst, N.Y.
Robert Lee Myers, Jr.	Baltimore, Md.
Lyman Breed Nason	Tyrone
Harry Bauer Sames	Philadelphia
Robert Buchman Sax	Philadelphia
George Lloyd Schoen	Detroit, Mich.
Gustavus Sickles, Jr.	Newark, N.J.
Henry Allen Sterner	Pottsville
Roger Schofield Taylor	Conowingo, Md.
William John Urban	Reading

Ordnance

Luther Huyette Bender	Wernersville
Forest Theodore Benton, Jr.	Somerville, Mass.
William Owens Heilman	Harrisburg
John Richard Leader	Shamokin
George Samuel Prokop	Bethlehem
Arthur Llewellyn Roberts, Jr.	Westfield, N.J.
Clarence Lichty Snavely	Lancaster
Ralph Aloysius Visco	Wood-Ridge, N.J.
Daniel Herman Wenny, Jr.	Orange, N.J.

CERTIFICATES OF ELIGIBILITY FOR COMMISSIONS AS SECOND LIEUTENANT IN THE OFFICERS' RESERVE CORPS

(Commissions withheld because of the candidates being under age)

Infantry

John Karsten Ahlberg	Brooklyn, N.Y.
Andrew Max Henry	Augusta, Ga.
Philip Marx Zimmerman	Brooklyn, N.Y.

Ordnance

John Richard Kostes	Shenandoah
Charles Martin Schwitter	Montclair, N.J.

Degrees conferred on Founder's Day, October 2, 1929

HONORARY DEGREES

DOCTOR OF SCIENCE

John Johnston, B.Sc., M.A., D.Sc.	Kearny, N.J.

DOCTOR OF LAWS

Willis Rodney Whitney, Ph.D., D.Sc., D.Ch.	Schenectady, N.Y.

DEGREES IN COURSE

MASTER OF SCIENCE

Cyril Dewey Jensen, B.S. in C.E. *(University of Minnesota)*	Bethlehem

BACHELOR OF ARTS

Raymond Philip Black	Irvington, N.J.
Felix Bodalski	Nanticoke
Jacob Levitz	New York, N.Y.
Edward Lyons, Jr.	Brooklyn, N.Y.
Joseph Ricapito	Bethlehem
Adolph Schiff	New York, N.Y.
Kenneth Enders Sheetz	Enola
David Troderman	Dorchester, Mass.

BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION

Lewis Carl Beck	New Haven, Conn.
John Milton Blackmar	East Orange, N.J.
Millard Herman Citron	White Plains, N.Y.
Aaron Elwood Hess	Lancaster
Ralph Eugene Ward	Dalton

CHEMICAL ENGINEER

Forrest Samuel Stieff	Reiffton

CIVIL ENGINEER

Thomas Herbert Carey Coxe	Bethlehem
Carl Isaacson	Brooklyn, N.Y.
George Julius Neumann	Allentown

ELECTRICAL ENGINEER

Robert Carl Richard March	Philadelphia
Richard Bell Mancke	Bethlehem

BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

Herbert Adrian Riker, Jr.	Amityville, N.Y.

METALLURGICAL ENGINEER

Stanley Benning Adams	Baltimore, Md.
Robert Maynard Brick	Atlantic City, N.J.

ENGINEER OF MINES

George Weldon Moyer	Souderton

HONORS AND PRIZES

Announced on University Day, June 11, 1929

GRADUATION HONORS

Graduated with High Honors

Michael Smyser Ebert	Ch.E.	Wilmington, Del.
Charles Willard Granacher	C.E.	Scranton
Plantou Middleton	I.E.	Philadelphia
Kenneth Moore Simpson	Phys.	Pottstown
Horace Gotwald Wiest	E.E.	York

Graduated with Honors

John Karsten Ahlberg	Arts	Brooklyn, N.Y.
Arthur Bryant Achilles	E.E.	West New Brighton, N.Y.
Ralph John Albright	C.E.	Allentown
Arthur James Blythe	Arts	Clark's Summit
Thomas Moran Brennan	Bus.	Rockville Centre, N.Y.
Harold Charles Eschenlauer	Bus.	Woodcliff, N.J.
John Powell Evans	C.E.	Freeland
Ward Clarke Faust	Bus.	Catasauqua
Joseph Ellsworth Fopeano	E.M.	Middleburg
Samuel Garwood	Bus.	Medford, N.J.
John William Gehrke	E.E.	Reading
Cecil William Guyatt	E.E.	Upper Darby
George Miller Hebbard	Ch.E.	Washington, D.C.
Jóhn Irvine Kirkpatrick	Bus.	Woodhaven, N.Y.
Carl Frederick Kurtz	I.E.	Bethlehem
Arthur Edward Magill	Bus.	Newark, N.J.
William Treverton Odgers	I.E.	Parkersburg, W.Va.
Charles Tilghman Oswald	Ch.E.	Fullerton
Stanley Urmston Phares	Arts	Elizabeth, N.J.
William Joseph Pollitt	E.M.	Bridgeport, Conn.
Philip Henry Reeves	E.E.	Wildwood, N.J.
James Bertrand Reill	C.E.	Scranton
Walter Henry Salzenberg	Ch.E.	Woodcliff, N.J.
Irving Hoos Schwab	Arts	Bath
Clarence Lichty Snavely	C.E.	Lancaster
Walter A. VanFleet	C.E.	Somerville, N.J.
Ralph Aloysius Visco	Ch.E.	Wood-Ridge, N.J.
Charles Edmunds Webbe	M.E.	Summit, N.J.
August Joseph Wiesner, Jr.	Arts	Bergenfield, N.J.
Philip Marx Zimmerman	I.E.	Brooklyn, N.Y.

GRADUATED WITH SPECIAL HONORS

Marvin Sidney Borowsky	(English)	Philadelphia
Bernard Lawton Opolinsky	(Philosophy)	Brooklyn, N.Y.
Stanley Urmston Phares	(Psychology)	Elizabeth, N.J.

HONOR GRADUATES IN THE RESERVE OFFICERS' TRAINING CORPS

Infantry Unit

Lyman Breed Nason	Tyrone
Robert Buchman Sax	Philadelphia

GRADUATED WITH HONOR

Robert Maynard Brick	Atlantic City, N.J.

Prizes

WILLIAMS SENIOR PRIZES IN ENGLISH
First Prize, $75.00
Marvin Sidney Borowsky — Philadelphia

WILLIAMS SENIOR PRIZES IN ECONOMICS
Second Prizes, $25.00 each
Thomas Baird Lewis — Kingston
Stanley Urmston Phares — Elizabeth, N.J.

WILLIAMS SENIOR PRIZES IN PHILOSOPHY AND PSYCHOLOGY
Second Prize, $25.00
August Joseph Wiesner, Jr. — Bergenfield, N.J.

WILLIAM H. CHANDLER PRIZE, $25.00, to the highest ranking senior in the curricula in Chemistry and Chemical Engineering
William Smyser Ebert — Wilmington, Del.

ELECTRICAL ENGINEERING PRIZE, $25.00, for the best E.E. thesis
Cecil William Guyatt — Upper Darby

METALLURGICAL ENGINEERING SENIOR PRIZE, $50.00
Robert Maynard Brick — Ventnor, N.J.

AMERICAN SOCIETY OF CIVIL ENGINEERS JUNIOR MEMBERSHIP PRIZE, $20.00
Charles Willard Granacher — Scranton

Freshman and Sophomore Honors, 1928-1929

Announced on Founder's Day, October 2, 1929

(Awarded to those members of the Classes of 1931 and 1932 who made an average grade of B or higher during the scholastic year 1928-1929.)

FRESHMAN HONORS

Wilton Altman	Arts	Bethlehem
John Elmer Angle, Jr.	Met.	Mansfield, O.
William Ogle Bennett, Jr.	M.E.	Lancaster
Lawson Valentine Britton, Jr.	E.E.	Scranton

Edward St. Clair Buckler, Jr.	E.E.	Baltimore, Md.
Thomas Stevens Cleaver	E.M.	Reading
Joseph William DeFuria	Bus.	Chester
William Cronk Elmore	E.E.	Montour Falls, N.Y.
Roger Illick Fluck	C.E.	Bethlehem
Henry Heyward Fryling	C.E.	South Orange, N.J.
Walter Fuhrer	Ch.E.	Jersey City, N.J.
Edward Martin Gormley	M.E.	Hazleton
William Kenneth Griesinger	Ch.E.	Plainfield, N.J.
Donald Wilson Haff	Arts	Northampton
Edward Borlsdoll Hildum	M.E.	Plainfield, N.J.
George Austin Hottle	Ch.E.	Bethlehem
Theodore Robert Kellner	C.E.	Drexel Hill
Henry Penn Krusen	Arts	Freehold, N.J.
David Lewis MacAdam	E.E.	Upper Darby
Nathan Griffith Macadam	Arts	Catasauqua
Donald Henry May	E.E.	Hazleton
Emanuel Ellington Minskoff	Arts	New York, N.Y.
Francis Maylum Morris	E.E.	Lansdale
Harry Brooks Osborn, Jr.	Ch.E.	Newark, N.J.
Benjamin Rabinowitz	C.E.	Scranton
Robert Holland Raring	E.M.	Harrisburg
Charles Howard Robson	C.E.	Lansdowne
Arthur George Rohrs	I.E.	Ridgewood, N.J.
Maurice Binion Rosalsky	Arts	New York, N.Y.
John Wesley Schneider	E.E.	Lancaster
Irving Schultz	Arts	Newark, N.J.
Ned Schwartz	Arts	Brooklyn, N.Y.
Raymond Koch Serfass	I.E.	Pottsville
Ray Gernert Shankweiler	E.E.	Allentown
Elias Allie Sindel	Arts	Brooklyn, N.Y.
Charles Byron Slichter	Ch.E.	Reading
William Henry Spath	Arts	Hoboken, N.J.
Edgar Samuel Stem, Jr.	E.E.	Alderson
Robert Howard Swoyer	E.E.	Hazleton
William Chamberlain Warner	Arts	Montrose
Paul Oscar Young	Phys.	Kingston

Sophomore Honors

Robert Ligget Baird, Jr.	E.M.	Lansdowne
John Downey Benedict	M.E.	Waynesboro
Leroy Stanley Billman	E.E.	Landisburg
James McVey Bisbee	E.E.	Susquehanna
Jay Harold Boltz	E.E.	Lebanon
Philip Smyser Davis	E.M.	Lebanon
Elmer Charles Easton	E.E.	Newark, N.J.
Walton Forstall, Jr.	M.E.	Rosemont
John Edwin Freehafer	Phys.	Reading
Samuel Harry Goodman	Bus.	Bethlehem
Clyde Albert Harding	Arts	Pen Argyl
Dudley Lee Harley	Arts	Martinsburg, W.Va.

Robert Graves Hess	M.E.	Dallas
Charles August Jeanson, III	Ch.E.	Brooklyn, N.Y.
Ogden Austin Kantner	E.M.	Creskill, N.J.
Harry Charles Kelly	Phys.	Wilkes-Barre
Carl Harry Herbert Krott	C.E.	Reading
Charles Raymond Lowenstein	Arts	Newark, N.J.
Hyman Mayer	Arts	Brooklyn, N.Y.
John George Meharg	Arts	Hamburg
John Clewell Mertz	Ch.E.	Allentown
Leon Sylvester Millelot	Ch.E.	Lyndhurst, N.J.
Harry Miller	Arts	Bethlehem
Francis Neuwirth	Arts	Brooklyn, N.Y.
George John Schaumburg	C.E.	Reading
Paul Wesley Seal	E.E.	Factoryville
Irving Michael Siegel	Arts	New York, N.Y.
Harold Edwin Sincock	Ch.E.	Sparrows Point, Md.
Sydney Raymond Snitkin	Arts	New York, N.Y.
Edward Preston Sordon	E.E.	Riverton, N.J.
Walter John Tomlinson, Jr.	Ch.E.	Arlington, N.J.
Erwin Frederic Underwood	Arts	Newport, R.I.
Joseph Russell Walsh	Met.	New York, N.Y.
Moses Waltman	Arts	Brooklyn, N.Y.

Prizes

WILBUR PRIZES, FRESHMAN YEAR

Mathematics, First Prize, $15.00
William Cronk Elmore — Montour Falls, N.Y.
Second Prize, $10.00
David Lewis MacAdam — Upper Darby
English, $15.00
Benjamin Rabinowitz — Scranton
German, $15.00
Clinton Albert Feissner — Eckley
French, $15.00
Wilton Altman — Bethlehem

WILBUR PRIZES, SOPHOMORE YEAR

Mathematics, $10.00
Harry Charles Kelly — Wilkes-Barre
English, $10.00
Clyde Albert Harding — Pen Argyl
Physics, $10.00
John Edwin Freehafer — Reading

WILLIAMS FRESHMAN PRIZES IN ORAL COMPOSITION

First Prize, $40.00
David Davis — Freeport, N.Y.
Second Prize, $15.00
Henry Penn Krusen — Freehold, N.J.

Williams Sophomore Prizes in English Composition	
First Prize, $50.00	
Dudley Lee Harley	Martinsburg, W.Va.
Second Prize, $25.00	
Clyde Albert Harding	Pen Argyl
Third Prize, $15.00	
Kenneth Karl Kost	Gary, Ind.
Williams Junior Prizes in English Composition	
First Prize, $40.00	
Lloyd Garrison Wilson	New York, N.Y.
Second Prize, $15.00	
Gabriel Martin Ondeck	Hazleton
Alumni Prizes in Public Speaking	
First Prizes, $25.00 each	
Laurence Justin Ackerman	Far Rockaway, N.Y.
Thomas Webster Matchett	Passaic, N.J.
Second Prizes, $15.00 each	
Philip Cornelius Lewis	Tenafly, N.J.
Erwin Frederic Underwood	Newport, R.I.
Third Prizes, $10.00 each	
Carl Harry Herbert Krott	Reading
Arthur Alan Sullivan	Tenafly, N.J.
Loomis Prizes in Public Speaking	
Courses 10 and 11	
First Prizes, $15.00 each	
William Frederick Powell, Jr.	Upper Darby
Raymond LeCount Roper	Richmond Hill, N.Y.
Erwin Frederic Underwood	Newport, R.I.
Second Prizes, $10.00 each	
George McKeown Patterson	Huntington, W.Va.
Louis Posnak	Bayonne, N.J.
Harold Aloysius Seward	Parkersburg, W.Va.
Course 14	
First Prize, $25.00	
Sydney Raymond Snitkin	New York, N.Y.
Second Prize, $15.00	
Harry Stothoff Jenkins	Bethlehem
Omicron Delta Kappa Prizes (Freshman Theme Contest)	
First Prize, $15.00	
David Lewis MacAdam	Upper Darby
Second Prize, $5.00	
George Cass Hutchinson, Jr.	Sewickley

MATHEMATIC PROBLEM PRIZES

Robert Edgar Gohl	Harrisburg
Joseph Edward Illick	Bethlehem
John Dale Kelly	Pelham Manor, N.Y.
David Lewis MacAdam	Upper Darby
Benjamin Rabinowitz	Scranton
Alfred Nathan Rogers	Reading
Robert Frankel Serber	Philadelphia
John Detwiler Woodward	Bala-Cynwyd

WILLIAM H. CHANDLER CHEMISTRY PRIZES

Freshman Year, $25.00

Charles Byron Slichter	Reading

Sophomore Year, $25.00

John Clewell Mertz	Allentown

Junior Year, $25.00

Carl Richard Woll	Philadelphia

METALLURGICAL ENGINEERING PRIZE

Sophomore Year, $50.00

Joseph Russell Walsh	Somerville, N.J.

ALUMNI JUNIOR PRIZES

Industrial Engineering, $25.00

Willard Arrison MacCalla	Youngstown, O.

Civil Engineering, $25.00

Robert Edgar Gohl	Harrisburg

WILBUR SCHOLARSHIP, $200.00, to the Sophomore with the best record

John Clewell Mertz	Allentown

TAU BETA PI PRIZE (slide rule), to the highest technical freshman

Benjamin Rabinowitz	Scranton

ETA SIGMA PHI MEDAL, for the best work in Sophomore Collegiate Latin

Hyman Mayer	Brooklyn. N.Y.

PHI SIGMA KAPPA SCHOLARSHIP CUP (awarded for one year to the fraternity in the Interfraternity Council having the highest scholarship average for the preceding year)

Pi Lambda Phi

TRUSTEES' SCHOLARSHIP CUP (awarded for one year to the living group having the highest scholarship average for the preceding year)

Pi Lambda Phi

STUDENTS, 1929–1930

GRADUATE STUDENTS

Name	*Candidate for*	*Residence*
Ball, George Loyal, Jr., B.S. in Chem. *(Pennsylvania State College)*	M.S. (Major: Chemistry)	Pittsburgh
Barnes, Leland Spencer, B.A., M.S. *(Occidental College, Lehigh University)*	M.A. (Major: Mathematics)	Bethlehem
Beal, George Francis, B.S. in Ch.E. *(Iowa State College)*	M.S. (Major: Chemistry)	Omaha, Neb.
Beary, Joyce Elizabeth, B.A. *(Moravian College for Women)*	M.A. (Major: History)	Allentown
Benton, Forest Theodore, Jr., Ch.E. *(Lehigh University)*	M.S. (Major: Chemistry)	Somerville, Mass.
Binkley, Elmer Raymond, B.S. *(Franklin and Marshall College)*	M.S. (Major: Physics)	Millway
Clauss, Howard D., A.B., A.M. *(Muhlenberg College, New York University)*		Bowmanstown
Clemmer, Jacob Lee, B.S. *(University of Chattanooga)*	M.S.	Benton, Tenn.
Cook, Nevin John, B.A. *(Lehigh University)*	M.A. (Major: Education)	Drums
Davies, Rosa Ellen, B.S. in Ed. *(Temple University)*	M.A. (Major: Education)	Bethlehem
DeGray, Richard John, Ch.E., M.S. *(Lehigh University)*	(Major: Chemistry)	Ramsey, N.J.
Eisenhard, John Luther, B.A. *(Muhlenberg College)*	M.A. (Major: History)	Cementon
Farrell, Michael Anthony, B.S. *(Pennsylvania State College)*	M.S. (Major: Bacteriology)	Waverly
Fox, Bertha Sprague, B.A. *(Moravian College for Women)*	M.A. (Major: History)	Bethlehem
Girvin, Christiana Edna, Ph.B. *(Muhlenberg College)*	M.A. (Major: History)	Allentown
Greiner, Earl Shirk, B.S. in Met.E. *(Carnegie Institute of Technology)*	M.S. (Major: Metallurgy)	Lebanon
Hartman, Earl John, B.A. *(Bucknell University)*	M.A. (Major: History)	Slatington
Hartman, Paul Vincent, B.A. *(Moravian College)*	M.S. (Major: Chemistry)	Bethlehem
Harvey, Wilber Edward, Met.E. *(Lehigh University)*	M.S. (Major: Metallurgy)	Catasauqua
Hoback, Waller Howard, A.B. *(Roanoke College)*	M.S. (Major: Chemistry)	Roanoke, Va.
Hollenbach, Aral Miles, B.S. *(Muhlenberg College)*	M.S. (Major: Chemistry)	Allentown

Holmes, Ernest George Nosworthy, Ph.B., S.T.B.	M.A.	Bethlehem
(Wesleyan University, Boston University)	(Major: Philosophy)	
Hoyler, Cyril Nathaniel, B.S.		Green Bay, Wis.
(Moravian College)		
Illick, Joseph Edward, C.E.	M.S.	Bethlehem
(Lehigh University)	(Major: Mathematics)	
Kern, David Alfred, A.B.	M.A.	Slatington
(Ursinus College)	(Major: History)	
Kistler, Effie Mildred, A.B.	M.A.	Allentown
(Cedar Crest College)	(Major: History)	
Kratz, Philip, Ch.E.		Bethlehem
(Lehigh University)		
Laubach, Benjamin William, B.S.	M.A.	Catasauqua
(Muhlenberg College)	(Major: Education)	
Leidich, Edwin Enos, B.S.	M.S.	Catasauqua
(Muhlenberg College)	(Major: Physics)	
Long, John DeHaven, B.S.	M.S.	Lancaster
(Franklin and Marshall College)	(Major: Chemistry)	
MacDougall, Elizabeth, B.A.	M.A.	Bethlehem
(University of Wisconsin)	(Major: Bacteriology)	
Marshall, Theodore Henry, B.S.	M.S.	Waterloo, Ia.
(Iowa State College)	(Major: Chemistry)	
Maylott, Carleton Francis, B.S. in E.E.	M.S.	Derby, Conn.
(Worcester Polytechnic Institute)	(Major: Electrical Eng.)	
McCarter, William S. Wright, B.S. in Ch.E.	M.S.	Philadelphia
(Pennsylvania State College)	(Major: Chemistry)	
Midlam, Edward West, Jr., Ch.E.	M.S.	Wilmington, Del.
(Lehigh University)	(Major: Chemistry)	
Miller, Jerome Martin, B.S., M.S.		Bethlehem
(Franklin and Marshall College)		
Miller, John Zollinger, Ch.E.	M.S.	Harrisburg
(Lehigh University)	(Major: Chemistry)	
Mohr, Ella Bortz, Ph.B.	M.A.	Allentown
(Muhlenberg College)	(Major: History)	
Mosesco, Philippus, B.A., B.S. in Ed.	M.A.	Allentown
(Muhlenberg College, Kutztown State Teachers College)	(Major: Philosophy)	
Mowrer, Robert Kready, B.S.	M.S.	Lancaster
(Franklin and Marshall College)	(Major: Physics)	
Newhard, Stella Elizabeth, Ph.B.	M.A.	Allentown
(Muhlenberg College)	(Major: History)	
Nicholas, Dorothy Louise, A.B.	M.A.	Allentown
(Hood College)		
Osteen, John Allen, B.S.	M.S.	Piedmont, S.C.
(Furman University)	(Major: Physics)	
Oswald, Charles Tilghman, Ch.E.	M.S.	Fullerton
(Lehigh University)	(Major: Chemistry)	

Parkinson, Gordon Wesley, B.S. in C.E. *(University of Saskatchewan)*	M.S. (Major: Civil Eng.)	Saskatoon, Sask., Canada
Prentiss, Henry Moeller, Ph.B. *(Muhlenberg College)*	M.A. (Major: History)	Easton
Rheineck, Alfred Edward, B.S. in Ch.E. *(University of Wisconsin)*	M.S. (Major: Chemistry)	Milwaukee, Wis.
Schier, Oscar Bernhardt, M.E. *(Lehigh University)*	M.S. (Major: Civil Eng.)	Ellicott City, Md.
Schoffstall, Charles Foster, Ph.B. *(Muhlenberg College)*	M.A. (Major: Education)	Pottsville
Schrope, Guy Sylvester, B.S. *(Muhlenberg College)*	M.A. (Major: Education)	Allentown
Schwartz, Paul Englebert, B.S. *(Lehigh University)*		Harrisburg
Shugart, Lehman Charles, A.B. *(Indiana University)*	M.S. (Major: Physics)	Marion, Ind.
Sowers, Harry E., Ph.B. *(Muhlenberg College)*	M.A. (Major: Psychology)	Pleasant Valley
Thom, George Boyd, M.E. *(Lehigh University)*	M.S. (Major: Mech. Eng.)	Llanerch
Trembley, Francis John, B.S. *(Hobart College)*	M.S. (Major: Biology)	Naples, N.Y.
VanKeuren, Edwin, B.A. *(Lehigh University)*	M.A. (Major: Education)	Lebanon
Whitenight, Harold Philip, B.S., M.S. *(Muhlenberg College)*	(Major: Chemistry)	Allentown

UNDERGRADUATE STUDENTS

Arts—Arts and Science	E.M.—Mining Engineering
Bus.—Business Administration	Eng.—Freshman Engineering
Ch.E.—Chemical Engineering	I.E.—Industrial Engineering
Chem.—Chemistry	M.E.—Mechanical Engineering
C.E.—Civil Engineering	Met.—Metallurgical Engineering
E.E.—Electrical Engineering	Phys.—Engineering Physics

Aaron, William Sherman, Jr.	Bus.,'33	Altoona
Abbe, Richard Taylor	Eng.,'33	Kennett Square
Abrahams, Moses	Arts,'33	Brooklyn, N.Y.
Abrahams, Sylvan	Arts,'33	Brooklyn, N.Y.
Ace, Edward Bromell	Bus.,'33	Stroudsburg
Ackerman, Cleon Cleveland	Eng.,'33	Lancaster
Adams, Henry Mason	Arts,'30	Fall River, Mass.
Albert, Philip Ernest	Bus.,'32	Trenton, N.J.
Alcorn, William Gaston	Arts,'31	Bethlehem
Alder, Robert, Jr.	Bus.,'30	Woodcliff, N.J.
Alexander, Jay Lewis	Bus.,'33	Pittston
Allen, Hamilton Fairfax	Bus.,'32	Forest Hills, N.Y.
Allen, Harvey Knight	Eng.,'33	Reading
Allison, Arthur James Brooks	Chem.,'31	Allentown
Allison, Samuel Deane	Bus.,'31	Allentown
Altland, Frederick Henry	E.E.,'31	Abbottstown
Altman, Wilton	Arts,'32	Bethlehem
Anamisakis, Anthony Fotis	Bus.,'33	Bethlehem
Anderson, Archibald Mac Gregor, Jr.	E.E.,'32	Brooklyn, N.Y.
Anderson, Donald Herbert	Eng.,'33	Pittsburgh
Anderson, James Evans	Eng.,'33	Tottenville, N.Y.
Anderson, John Buchanan Robinson	Met.,'32	New York, N.Y.
Anderson, Robert Lee	Ch.E.,'30	Worcester
Andrews, Harry, Jr.	Ch.E.,'31	Walnutport
Andrews, John Greer	Bus.,'33	Washington, D.C.
Angle, John Elmer, Jr.	Met.,'32	Mansfield, O.
Angle, Theodore Robinson, Jr.	Bus.,'33	Danville
Antoniotti, John James	Eng.,'33	Union City, N.J.
Arnold, Edward Leopold, Jr.	Arts,'33	East Orange, N.J.
Arrott, Albert Edward, Jr.	Eng.,'33	Pittsburgh
Arthur, William Leighley	Met.,'32	Pittsburgh
Askin, Simon	Bus.,'32	Mount Vernon, N.Y.
Atkins, David Bright	I.E.,'30	Pottsville
Aucott, William Connery	Eng.,'33	Philadelphia
Aufhammer, John Alan	Eng.,'33	Pittsburgh
Austin, Charles Augustus, II	Bus.,'31	Elmira, N.Y.
Austin, Edwin Albert	Eng.,'33	Washington, D.C.
Auten, John Hawkins	C.E.,'30	Corbett, Md.
Ayer, Fosdick Whitney	Eng.,'33	Plainfield, N.J.

Ayers, Allan, Jr.	E.E.,'32	Elizabeth, N.J.
Ayre, Thomas, Jr.	I.E.,'31	Miner's Mills
Bachman, Charles Russell	E.E.,'30	Upper Montclair, N.J.
Bachman, Robert Ruch	Eng.,'33	Upper Darby
Bachman, Walter Crawford	Eng.,'33	Nazareth
Badgley, William Gervaise, Jr.	I.E.,'30	Chatham, N.J.
Bahr, Paul Albert	E.E.,'30	Scranton
Bailey, George Hobart, Jr.	Bus.,'33	Pittsburgh
Bailey, Oakford Chandler	Eng.,'33	Pennsville, N.J.
Bailey, Samuel	Bus.,'32	Glendale, O.
Baird, Robert Ligget, Jr.	E.M.,'31	Lansdowne
Baker, Joseph Boyd	Eng.,'33	Pittsburgh
Baker, Robert Alt	E.E.,'30	Reading
Baker, William Perry	Bus.,'33	New Rochelle, N.Y.
Baldwin, Armand Raphael	I.E.,'32	Lansford
Bangsberg, Robert Ethan	Eng.,'33	La Crosse, Wis.
Banks, Carl Washington	E.E.,'31	Pottsville
Barber, Reginald Collinson	I.E.,'30	Ketchikan, Alaska
Barker, Frederick Simon	Bus.,'30	Bridgeton, N.J.
Barnard, Alfred Frank, Jr.	Met.,'32	North Arlington, N.J.
Barnes, Gared Clemens Landes	Bus.,'30	Haddonfield, N.J.
Barnes, Horace Allan	C.E.,'30	Philadelphia
Barney, Jerome	Eng.,'33	Wilkes-Barre
Barrows, Daniel Joseph	C.E.,'30	New York, N.Y.
Barthold, Kenneth Woodrow	Arts,'33	Bethlehem
Barthold, Ralph Waldo	Arts,'30	Bethlehem
Bascom, Franklin Buel	Arts,'33	Allentown
Bass, Harry	Arts,'33	Brooklyn, N.Y.
Bauer, Charles Henry, Jr.	C.E.,'30	East Orange, N.J.
Bauman, Maurice	Arts,'33	New York, N.Y.
Baur, Albert Campbell	Ch.E.,'31	Bethlehem
Baxendale, Francis William	Eng.,'33	Flushing, N.Y.
Beachler, Harold Roy	Bus.,'32	Crafton
Beard, Wilfred George	E.E.,'31	Katonah, N.Y.
Beasley, Revere	Arts,'31	Glen Ridge, N.J.
Beaver, Donald Payne	Met.,'32	Bethlehem
Beck, James Wilson	Arts,'30	Millville, N.J.
Becker, Lewis William, Jr.	Ch.E.,'30	Trenton, N.J.
Beckwith, George Nicholas	Bus.,'33	Pittsburgh
Beggs, Douglas Raiguel	Eng.,'33	Reading
Behney, Paul Aaron	Phys.,'32	Freeland
Bell, James McKim	Eng.,'33	Rio de Janeiro, Brazil
Bell, John Wade, Jr.	Eng.,'33	Quinwood, W.Va.
Bellezza, Alexander Joseph	Arts,'33	Freeland
Belmore, Albert Joseph, Jr.	E.M.,'32	Schuyler, Va.
Benedict, John Downey	I.E.,'31	Waynesboro
Benner, Hartford Glassmyer	Arts,'32	Coopersburg
Bennetch, Leonard Muhlenberg	Ch.E.,'30	Lebanon

Bennett, Charles Albert	Eng.,'33	White Plains, N.Y.
Bennett, John Doane	Bus.,'32	Worcester, Mass.
Bennett, Robert Granville	Eng.,'33	Narberth
Bennett, Robert Sherman	Bus.,'30	East Orange, N.J.
Bennett, Warren Henry	Arts,'30	Rockville Centre, N.Y.
Bennett, William Ogle, Jr.	Phys.,'32	Lancaster
Benson, Arthur Leonard	Eng.,'33	Easton, Md.
Benson, Ralph Criswell	Arts,'32	Brooklyn, N.Y.
Berg, Leon	Arts,'31	Philadelphia
Berger, Francis Joseph	Eng.,'33	Old Forge
Berger, Vincent Paul	M.E.,'32	Aberdeen Proving Ground, Md.
Berkowitz, Sydney Bernard	Arts,'32	Brooklyn, N.Y.
Berlin, Aaron Samuel	Eng.,'33	Wilmington, Del.
Bernstein, Gerald Alan	Arts,'32	New York, N.Y.
Best, Daniel Elwert	Phys.,'32	Stanhope, N.J.
Bienfang, George John	E.M.,'32	Linden, N.J.
Bierling, Benjamin Herbert	Eng.,'33	Monsey, N.Y.
Bijou, Sidney William	Bus.,'32	Brooklyn, N.Y.
Billman, Leroy Stanley	E.E.,'31	Landisburg
Bilski, Peter John	Eng.,'33	Jermyn
Bindley, John	Bus.,'33	Pittsburgh
Bingaman, Samuel Pierce	Eng.,'33	Allentown
Bingham, Melville Comstock	M.E.,'32	Rome, N.Y.
Bird, William Eric	Met.,'32	Birmingham, England
Biro, Frank	Arts,'33	Bethlehem
Bisbee, James McVey	E.E.,'31	Susquehanna
Bishop, Charles Justus	Arts,'31	Scranton
Blackmar, William Edgar	Bus.,'30	East Orange, N.J.
Blair, Robert Irving	Arts,'30	River Edge, N.J.
Blank, Joseph	Arts,'33	Jamaica, N.Y.
Bliss, Wilbur Agnew, Jr.	Eng.,'33	Beaver
Blood, John Edward	Arts,'31	Philadelphia
Bloom, Louis Morris	Bus.,'31	Philadelphia
Bloomer, Rundle Waite	Eng.,'33	Brewster, N.Y.
Blum, Samuel	Bus.,'32	Allentown
Blumberg, Eugene	Arts,'33	Wyomissing
Bock, Louis	Arts,'33	Bethlehem
Bogart, Maurice Stanley	Arts,'31	New York, N.Y.
Bohner, John Allen	Arts,'30	Catasauqua
Boies, Clayton Sumner, Jr.	Bus.,'30	Seymour, Conn.
Bollman, John Adam	Eng.,'33	Lebanon
Boltz, Jay Harold	E.E.,'31	Lebanon
Bomhoff, Lewis Fred, Jr.	I.E.,'32	Jackson, Mich.
Booker, Julian Harvey	Bus.,'32	Wilmington, Del.
Boosin, Zachary	Arts,'30	New York, N.Y.
Boquel, Francis Peter	Bus.,'33	Bethlehem
Borden, Kennard Fleming	Eng.,'33	Collingswood, N.J.
Boughner, Jackson Leroy	Arts,'33	Manhattan, Kan.
Bounds, Ardrey Middleton	Eng.,'33	Philadelphia

Bovard, John Wilson	Eng.,'33	Toledo, O.
Bowden, George Smith	Arts,'33	Nutley, N.J.
Bower, Donald Langlitz	M.E.,'30	Harrisburg
Bowman, Charles Thomas, Jr.	Arts,'33	Camp Hill
Boyd, James Daskin, Jr.	Arts,'31	Bayonne, N.J.
Boyd, Robert Putnam	Eng.,'33	Staten Island, N.Y.
Boyer, Harry Jeremiah	Ch.E.,'32	Egypt
Boyer, Lee Calvin	C.E.,'30	Shamokin
Bradin, John Percy, Jr.	Arts,'33	Elizabeth, N.J.
Brady, William Young, Jr.	Bus.,'31	Chevy Chase, Md.
Branda, Richard Randolf	Eng.,'33	Brooklyn, N.Y.
Brandner, John David	Ch.E.,'32	Bethlehem
Braun, Robert Carl	Ch.E.,'31	Reading
Braverman, Joseph Harry	Bus.,'33	Philadelphia
Bray, William Edwin	Arts,'33	Freeland
Brener, Daniel Augustus	Arts,'32	New York, N.Y.
Brennan, Bernard Elliott	Eng.,'33	Rockville Centre, N.Y.
Brennesholtz, Louis LeGrande	Bus.,'32	East Orange, N.J.
Brettner, Louis Allen	Arts,'31	Allentown
Brewer, John Gilmore	Bus.,'31	Pittsburgh
Breyley, William Byron, Jr.	Bus.,'33	Buffalo, N.Y.
Briggs, Milton Alver	C.E.,'30	Bradley Beach, N.J.
Brigham, Douglass	Bus.,'33	Highland Park, Ill.
Britton, Lawson Valentine, Jr.	M.E.,'32	Scranton
Bronstein, Jesse Bayliss, Jr.	Arts,'30	Allentown
Brooks, Leonard	C.E.,'32	Philadelphia
Brosz, Paul Albert	C.E.,'31	Philadelphia
Brotzman, Edward Stephen	E.E.,'30	Easton
Brower, Theron Emmet	Met.,'30	Little Silver, N.J.
Brown, Jack Baldwin	Bus.,'30	Scranton
Brumbach, George Edward	Met.,'32	Esterly
Buchanan, William Christian	Eng.,'33	Philadelphia
Buck, Robert Oswald	Eng.,'33	Bethlehem
Buckler, Edward St.Clair, Jr.	Met.,'32	Baltimore, Md.
Bullard, Dexter	C.E.,'30	Kew Gardens, N.Y.
Burger, Dallas Osville	Phys.,'30	Allentown
Burhouse, William Alfred	Eng.,'33	Drexel Park
Burk, Russell Williams	Bus.,'33	Newark, N.J.
Burns, Hugh Francis	Ch.E.,'30	Catasauqua
Burns, Roy Herman	Bus.,'31	Harrisburg
Burt, Charles Everett	Bus.,'32	Hartford, Conn.
Busch, Herbert Hertgen	Bus.,'31	Newark, N.J.
Button, John Conyers, Jr.	Bus.,'32	Maplewood, N.J.
Byers, Lewis Cunningham	Eng.,'33	Catonsville, Md.
Calder, George Cliff	C.E.,'30	Lancaster
Callan, Thomas John	Bus.,'31	Flushing, N.Y.
Camden, Graham Blackford	I.E.,'31	Parkersburg, W.Va.
Campbell, Charles, Jr.	Eng.,'33	Fullerton
Campbell, Charles, Jr.	Eng.,'33	Pittsburgh

Campbell, James Crosby	Bus.,'33	Flushing, N.Y.
Campbell, James Rue	E.E.,'30	Long Branch, N.J.
Cannan, Roland	Arts,'30	Philadelphia
Canonico, Stephen	Eng.,'33	Red Bank, N.J.
Canton, Lester	Arts,'32	New York, N.Y.
Carl, Howard Frederick	Eng.,'33	Washington, D.C.
Carlin, Max	Arts,'31	Brooklyn, N.Y.
Carlson, Donald Frederick	Eng.,'33	New Rochelle, N.Y.
Carr, Robert Franklin	Met.,'31	Monongahela
Carrier, Lester Revillo, Jr.	Eng.,'33	Covington, Va.
Carrillo, Andres, Jr.	Eng.,'33	Habana, Cuba
Carroll, William Franklin	Eng.,'33	Philadelphia
Casselman, Howard Frederick	I.E.,'32	South Orange, N.J.
Castellano, Nicholas Ilaria	Arts,'32	Newark, N.J.
Castles, Hugh Witherow	Arts,'30	Mechanicsburg
Cerf, Ernest Eugene	Bus.,'32	Flushing, N.Y.
Chandler, Libert Theodore	M.E.,'32	Bethlehem
Chanin, Marcy	Arts,'33	New York, N.Y.
Chapin, Henry Merritt	Eng.,'33	Flushing, N.Y.
Chapman, Richard Douglass	I.E.,'30	Jenkintown
Charles, William Henry, Jr.	Eng.,'33	Riverside, Ill.
Chase, Curtis Alden	E.E.,'31	Danbury, Conn.
Chess, Robert Sterrett, Jr.	Bus.,'31	Crafton
Christman, Miles Shelly	M.E.,'30	Trumbauersville
Ciastkewicz, Arthur Joseph	E.M.,'31	Hackettstown, N.J.
Ciulla, Thomas	Arts,'32	Brooklyn, N.Y.
Civardi, Arthur B.	Arts,'33	Bayside, N.Y.
Civardi, Walter Louis	Bus.,'33	Bayside, N.Y.
Clark, Robert Curtis	I.E.,'32	Pittsburgh
Clark, William Sargeant	Bus.,'32	Springfield, Mass.
Clarke, Jess Fellows	Eng.,'33	New York, N.Y.
Claus, Carl Oscar, Jr.	I.E.,'31	Plainfield, N.J.
Cleaveland, Charles Horace	Bus.,'31	Bethlehem
Cleaver, Thomas Stevens	E.M.,'32	Reading
Clegg, William James	Bus.,'31	Pittsburgh
Clifford, Donald Berridge	Eng.,'33	Brooklyn, N.Y.
Clifton, Merritt Robert	Bus.,'30	Baltimore, Md.
Clocker, Edwin Thompson	Ch.E.,'31	St. Clair
Clyne, Irving Milton	Arts,'30	Far Rockaway, N.Y.
Cobos, Leonard Forrester	Eng.,'33	Habana, Cuba
Cochran, Joseph William, Jr.	Bus.,'30	Williamsport
Coe, Edwin Merritt	Eng.,'33	Suffern, N.Y.
Cohen, Albert	Arts,'31	Brooklyn, N.Y.
Cohen, Saul Allen	Arts,'33	Lewistown
Cohn, Leslie McKinley	Arts,'31	New York, N.Y.
Cohn, Phineas William	Bus.,'33	New York, N.Y.
Collins, Edgar Albert	Arts,'32	Scranton
Collins, James Vallance	Bus.,'30	Rome, N.Y.
Collins, Joseph Gerard	Eng.,'33	Scranton
Collins, William Middleton	Arts,'32	Saranac Lake, N.Y.

Comins, Harrison Durgin	C.E.,'32	Vineland, N.J.
Conahan, Thomas Joseph, Jr.	Arts,'30	Hazleton
Condit, Stephen Hobart	Bus.,'31	Boonton, N.J.
Conneen, John Kearney	C.E.,'30	Maplewood, N.J.
Constable, Frederick Cortright	Bus.,'33	Palmerton
Conti, Vincent	Arts,'33	Brooklyn, N.Y.
Cook, Alonzo Edward	Bus.,'33	New York, N.Y.
Cook, William Franklin	Eng.,'33	Sylvan
Cooper, Charles William	Eng.,'33	Sewickley
Cooper, George Ellsworth	Ch.E.,'31	Coopersburg
Cooper, George Mullen	E.E.,'31	Sewickley
Cooper, Malcolm Everett	Eng.,'33	Paterson, N.J.
Copp, William Clifford	Eng.,'33	Flushing, N.Y.
Corbin, William Ross	Bus.,'31	Glenside
Coroniti, Fred, Jr.	Eng.,'33	Keiser
Coroniti, Samuel Charles	Phys.,'31	Keiser
Correll, Erwin Shivler	Bus.,'32	Easton
Coxe, Charles Dickey	Eng.,'33	Uniontown
Crawford, Donald James	Bus.,'33	Flushing, N.Y.
Crawford, Heber	Arts,'33	East Liverpool, O.
Crawford, William Stanley	Eng.,'33	Bentleyville
Cresswell, Ernest Jesse	I.E.,'31	Scranton
Crichton, Andrew Beachly, Jr.	Eng.,'33	Johnstown
Crichton, Clarendon Nelson	Arts,'33	Johnstown
Crispen, Hibberd Reese	Eng.,'33	Harrisburg
Crocco, Samuel Robert	C.E.,'32	Weedville
Crompton, Robert Henry, Jr.	Eng.,'33	Philadelphia
Cronin, John Howard	Bus.,'33	Yorklyn, Del.
Cross, George Howard, Jr.	Bus.,'30	Swarthmore
Crouse, William Burrill	Bus.,'33	Philadelphia
Culbertson, Harlow Wheeler	Bus.,'33	Sewickley
Culverwell, Joseph Mason	Eng.,'33	Washington, D.C.
Cunningham, Frederick Noel	I.E.,'32	Bethlehem
Cuntz, William Cooper	Met.,'30	Kew Gardens, N.Y.
Current, Watson Edward	E.M.,'32	Belleville, N.J.
Curtin, John, Jr.	Bus.,'30	Bellefonte
Cushman, Hall Watson	I.E.,'31	Bayside, N.Y.
Cyphers, Elmer Benjamin	Ch.E.,'31	Bethlehem
Dailey, John Woodward	M.E.,'30	Philadelphia
Dakin, Robert Calvin	Eng.,'33	Scranton
Dalling, Robert Henry	Bus.,'33	Stillwater, N.J.
Damm, Fred George	Bus.,'33	Newark, N.J.
Danko, Joseph Thomas	E.E.,'31	McKeesport
Danser, James Franklin	Ch.E.,'32	Collingswood, N.J.
Danser, Lowry Scattergood	Eng.,'33	Yardley
Datwyler, Howard Edward	C.E.,'31	Flushing, N.Y.
Davey, John Roderick	Met.,'30	Mansfield, O.
Davidowitz, Arthur Maxwell	Arts,'30	Scranton
Davidson, Coolidge, Jr.	I.E.,'31	Montclair, N.J.

Davidson, Douglas Treat, Jr.	Arts,'32	Claymont, Del.
Davidson, Nachman	Arts,'32	Baltimore, Md.
Davis, Alfred Jeremy	Bus.,'30	Scranton
Davis, Benjamin Miller	C.E.,'31	Freeland
Davis, Donald Edward	Bus.,'32	Allentown
Davis, Edward Russell	Arts,'30	Collingswood, N.J.
Davis, Philip Smyser	E.M.,'31	Lebanon
Davis, Ralph Claire	Bus.,'31	St. Petersburg, Fla.
Davis, Robert Lincoln	Eng.,'33	Norfolk, Va.
Day, Gaylord Hill	Eng.,'33	Perry Point, Md.
Dean, Russell Tattershall	Eng.,'33	Bethlehem
DeBerardinis, Vincent Anthony	C.E.,'32	Chester
Dechnik, Andrew	Arts,'31	Bethlehem
Deckard, Ralph Herman	M.E.,'30	Marysville
Decker, Harold Duane	Eng.,'33	Kerhonkson, N.Y.
Decker, Lemoyne Eugene	Eng.,'33	Harrisburg
Decker, Robert Benjamin	Bus.,'32	Elizabeth, N.J.
Decker, Robert Edgar	Bus.,'33	Douglaston, N.Y.
Dehm, Ernest William	Bus.,'30	New Britain, Conn.
DeHuff, Gilbert Lafayette, Jr.	E.M.,'30	Millville, N.J.
Deichler, John Kendig	C.E.,'30	Upper Darby
Delano, Frank	Bus.,'33	Glen Ridge, N.J.
Demms, Robert Singleton	Eng.,'33	New York, N.Y.
Dengler, Robert Meyer	Eng.,'33	Shenandoah
Denise, Charles Meirs, Jr.	Eng.,'33	Oakmont
Derrico, Charles	Bus.,'33	New York, N.Y.
DeTurk, Elder Pattison	Eng.,'33	Reading
Deutschman, Manuel	Eng.,'33	Easton
Dewees, George Malcolm	Eng.,'33	West Chester
Dey, John Stanley	Bus.,'30	Newark, N.J.
Dickerson, Julian Douglas	Met.,'31	Washington, D.C.
Diefenbach, James Cumins	Bus.,'33	Westfield, N.J.
Diehl, Stanley Clinton	E.E.,'30	Allentown
Diener, Karl Miller	Bus.,'33	Hamburg
DiMarie, Genero Charles	Arts,'33	Freeland
Dimont, Julius	Arts,'30	Staten Island, N.Y.
Dinkel, Jack Creighton	Bus.,'32	Buffalo, N.Y.
Dixon, George Scott	Bus.,'30	Butler
Dobbie, Charles Allen	Bus.,'33	Pittston
Doering, George Cooper	Arts,'33	Bryn Athyn
Dorney, Donald Frederick	Eng.,'33	Allentown
Dornin, George Armstrong, Jr.	Eng.,'33	Baltimore, Md.
Dorsett, George Chesley	M.E.,'30	Garwood, N.J.
Dorworth, Charles Edwin	Bus.,'32	Bellefonte
Doss, Virgil Augustus	Arts,'30	Hawthorne, N.J.
Doubleday, Thomas Patten	Bus.,'33	Cooperstown, N.Y.
Douglas, Edward Braislin	Phys.,'32	Plainfield, N.J.
Dow, Alan Wayne	M.E.,'30	Brookline
Dow, James Neal	Ch.E.,'30	Philadelphia

Dow, Langdon Cheves	Eng.,'33	Wilkes-Barre
Drake, Donald James	Bus.,'32	Buffalo, N.Y.
Drake, Herbert Ernest	Eng.,'33	East Orange, N.J.
Dresher, Melvin	Eng.,'33	Hackensack, N.J.
Dreyer, Herman Andrew	M.E.,'32	Freehold, N.J.
Drobek, Thaddeus William	Bus.,'32	Reading
Druckerman, Bertram Abraham	Arts,'33	Brooklyn, N.Y.
Drukker, Raymond Henry	M.E.,'31	Passaic, N.J.
Duke, Warren Vallean	Bus.,'32	Ridgewood, N.J.
Duncan, Arno Lee Roy, Jr.	E.E.,'32	Shillington
Duncan, James Edwin, III	Met.,'32	Washington
Dunn, Harvey Hopkins, Jr.	Bus.,'30	Philadelphia
Duram, George Thomas	Bus.,'32	Scarsdale, N.Y.
Durham, James Richard, Jr.	Arts,'31	Warren
Eagan, John William, Jr.	Eng.,'33	Youngstown, O.
Earhart, Kenneth Allen	Ch.E.,'30	Avonmore
Earich, Robert Allen George	Eng.,'33	Bethlehem
Earl, Robert Maxwell	Bus.,'32	Harrisburg
Easton, Elmer Charles	E.E.,'31	Newark, N.J.
Ebert, David Mathias	Eng.,'33	Wilmington, Del.
Eddleman, Edward Maurice	Arts,'33	Philadelphia
Eddleston, James Henry	Phys.,'32	Easton
Edelman, Sidney	Arts,'32	Highland Falls, N.Y.
Edelstein, Monroe Manning	Arts,'31	Brooklyn, N.Y.
Ehrlich, Lester	Arts,'32	Brooklyn, N.Y.
Eisenstaedt, Alfred	Bus.,'31	New York, N.Y.
Eldred, Kenneth Eugene	Bus.,'31	Bainbridge, N.Y.
Elkin, Philip	Arts,'32	Brooklyn, N.Y.
Elleni, Albert Umberto	Eng.,'33	West Pittston
Elliott, Henry Burns	M.E.,'32	Lansdowne
Elliott, Joseph Harold	Bus.,'30	Marcus Hook
Ellstrom, John Randolph	Eng.,'33	Bethlehem
Elly, Robert Duncan	M.E.,'32	Elizabeth, N.J.
Elmore, William Cronk	Phys.,'32	Montour Falls, N.Y.
Ely, George Willis	Bus.,'32	Holmdel, N.J.
Emery, Walter Earl	E.E.,'30	Mount Bethel
Emhardt, Fred William	M.E.,'30	Philadelphia
Engel, John Augustine	Arts,'32	Stamford, Conn.
Engelman, Louis Jacobs	Bus.,'33	Yonkers, N.Y.
Engelman, Robert Barnard	Bus.,'31	Yonkers, N.Y.
Engle, William Oliver	C.E.,'31	Scottdale
Engler, John Henry	Eng.,'33	Bangor
Enke, George Pryor, Jr.	Eng.,'33	East Orange, N.J.
Enscoe, Robert Haydock	Bus.,'32	Port Washington, N.Y.
Enslin, Edgar Harley	Bus.,'33	Wilkes-Barre
Epstein, David William	Phys.,'30	Bethlehem
Epstein, Edward	Bus.,'30	Easton
Ericson, John William, Jr.	Bus.,'33	Port Richmond, N.Y.
Ernstein, Harold	Bus.,'32	Far Rockaway, N.Y.

Essenfeld, Jesse	Bus.,'33	Brooklyn, N.Y.
Essick, Richard Jenkinson	Arts,'31	Reading
Ettlinger, Daniel Solinger	Arts,'31	New York, N.Y.
Evans, Anderson Force	Arts,'31	Elizabeth, N.J.
Evans, Paul Davies	Eng.,'33	Red Bank, N.J.
Everett, William Henry, Jr.	Bus.,'31	Bethlehem
Evers, Eben Francis	Bus.,'32	East Aurora, N.Y.
Eyster, Franklin Spangler	Eng.,'33	York
Eyster, William Myers, III	I.E.,'32	York
Fader, William Lewis, Jr.	I.E.,'32	Sewickley
Fairchild, Matthew Gilbert	I.E.,'32	Monterrey, N.L., Mex.
Falcone, Anthony	E.E.,'30	Roseto
Farabaugh, Robert Louis	Bus.,'33	Bethlehem
Fassett, Howard Lewis	Eng.,'33	Meshoppen
Faust, Henry Joseph	I.E.,'32	Catasauqua
Fay, Everett Armstrong	Bus.,'31	Cranford, N.J.
Feakins, George Hayes	Bus.,'30	Swarthmore
Feissner, Clinton Albert	Arts,'32	Eckley
Feldman, Albert	Arts,'32	Brooklyn, N.Y.
Feldman, Leon	Bus.,'33	New York, N.Y.
Felton, Walter Wiest	Eng.,'33	Chester
Fenner, Bayard Church, Jr.	Bus.,'33	South Orange, N.J.
Fenner, John David	Bus.,'30	South Orange, N.J.
Feucht, Robert	I.E.,'30	Lambertville, N.J.
Fezell, William Henry	Eng.,'33	Beaver
Figoni, William Gordy	Arts,'30	Springfield, Mass.
Findon, Brent Ernest	C.E.,'31	Bethlehem
Fischer, David Dave	Arts,'33	Long Branch, N.J.
Fisher, Carl Landis	Eng.,'33	Waynesboro
Fisher, Frank Lynn	E.M.,'32	Pottsville
Fisher, Karl Albert	Eng.,'33	Kutztown
Fismer, William Lucius	Eng.,'33	Verona, N.J.
Fitzpatrick, James Francis, Jr.	Arts,'32	Bayside, N.Y.
Fitzpatrick, Ralph Norris	Eng.,'33	Bayside, N.Y.
Flanigan, Pierce John Lawrence	Eng.,'33	Baltimore, Md.
Flaster, Joel Manuel	Arts,'32	Brooklyn, N.Y.
Fleischer, Edward	Arts,'33	Bethlehem
Fletcher, Theodore Francis	C.E.,'30	Philadelphia
Fluck, Roger Illick	C.E.,'32	Bethlehem
Foering, Howard Augustus, Jr.	Arts,'33	Bethlehem
Foley, William Romig	E.E.,'30	Allentown
Folk, John Henry, Jr.	Bus.,'33	Brielle, N.J.
Folwell, Charles Edmund, Jr.	C.E.,'32	Allentown
Folwell, John Davies	M.E.,'31	Allentown
Ford, William Michaux	Bus.,'33	New Harmony, Ind.
Forstall, Walton, Jr.	M.E.,'31	Rosemont
Forsyth, Henry James	Met.,'32	Buffalo, N.Y.
Foster, Kenneth Leroy	Eng.,'33	Rockville Center, N.Y.

Fountain, James Hopkins	Bus.,'33	Easton, Md.
Fouse, William Herman	Eng.,'33	Aliquippa
Frace, John William	Chem.,'32	Easton
Fralick, Ralph Stoddart	Eng.,'33	New York, N.Y.
Frantz, Alvin Jacob	Chem.,'30	Allentown
Frantz, George Jefferson, Jr.	Bus.,'33	Bethlehem
Frazier, Donald Gordon	Eng.,'33	East Orange, N.J.
Frederick, Ralph Horace	Eng.,'33	East Greenville
Freed, Henry	Bus.,'32	West Pittston
Freehafer, John Edwin	Phys.,'31	Reading
Freese, Frank Bernard	Ch.E.,'31	Lyndhurst, N.J.
Freiday, Donald Herbert	Eng.,'33	East Orange, N.J.
Freimark, Harry Robinson	Bus.,'33	Brooklyn, N.Y.
French, Frank John	Ch.E.,'32	New Rochelle, N.Y.
French, Walter Clayton	Eng.,'33	Philadelphia
Friedman, Bernard Arnold	Arts,'32	Brooklyn, N.Y.
Friedman, Bertram Jacob	Bus.,'31	New York, N.Y.
Friedman, Michael	Arts,'31	Newburgh, N.Y.
Friedman, Milton Jay	Arts,'33	Brooklyn, N.Y.
Friedman, Robert	Eng.,'33	Reading
Friedrich, Ferdinand LaRue	Ch.E.,'32	Hawthorne, N.J.
Fritts, James Anthony	Ch.E.,'32	Phillipsburg, N.J.
Fritz, John Raymond	Eng.,'33	Reading
Fritz, Samuel Frederick	Eng.,'33	Reading
Fritz, William Charles	Ch.E.,'32	Bethlehem
Frutiger, Thomas William	Eng.,'33	Red Lion
Frutkin, Leonard Baxter	Arts, '30	Mount Vernon, N.Y.
Fry, Nelson Becker, Jr.	Eng.,'33	Swarthmore
Fryling, Henry Heyward, Jr.	I.E.,'32	South Orange, N.J.
Fuhrer, Walter	Ch.E.,'32	Jersey City, N.J.
Fullagar, John Wotring	C.E.,'30	Catasauqua
Fuller, Charles Arthur, Jr.	Arts,'33	Mount Vernon, N.Y.
Fuller, Samuel Cassedy	Bus.,'31	Pittsburgh
Fulmer, John Edward	Bus.,'30	Bethlehem
Fulweiler, John Herbert	Arts,'33	Wallingford
Furman, William Amies, Jr.	E.M.,'31	Trenton, N.J.
Gabel, Martin	Arts,'33	Philadelphia
Gabler, Ernest Lang	Met.,'30	Holyoke, Mass.
Gadd, Frank Willis	C.E.,'32	Hartford, Conn.
Gadd, Robert Foster, Jr.	M.E.,'32	Hartford, Conn.
Gade, Roy Andrew	Arts,'30	Metuchen, N.J.
Gaetjens, Herbert August	Bus.,'32	Oradell, N.J.
Galanos, Miltiades Nicholas	M.E.,'32	New York, N.Y.
Galvin, Walter Corlett	C.E.,'31	Jamaica, N.Y.
Gamble, Robert William	Eng.,'33	Allentown
Gamble, William John	Eng.,'33	Allentown
Garber, John Franklin	Eng.,'33	Lumberville
Garrett, Robert Heil	Eng.,'33	Frackville
Geary, Daniel Henry	Bus.,'32	Springfield, Mass.
Geib, William High	Arts,'30	Reading

Geisel, John Jay	Bus.,'30	McKeesport
Gemmel, Richard Harold	Eng.,'33	Catasauqua
Gennet, Irving	Arts,'31	Newark, N.J.
Gentile, Columbus Richard	Eng.,'33	Newark, N.J.
George, Ruel Billings	E.E.,'30	Tunkhannock
Gerth, Harry John	Bus.,'33	Rockville Centre, N.Y.
Gettys, Paul Eugene	C.E.,'30	Harrisburg
Getz, Benjamin Leon	Bus.,'30	Allentown
Gherst, Richard Hummel	Eng.,'33	Intervilla
Gibbs, Wilbur Mercer	C.E.,'32	Yardley
Gibbs, William Charles	Eng.,'33	Netcong, N.J.
Gidding, Samuel Solomon	Arts,'30	Wildwood, N.J.
Giegerich, Carl Richard	Bus.,'32	Bayside, N.Y.
Gilbert, Roswell Ward	Eng.,'33	Brooklyn, N.Y.
Giles, Arthur Leonard, Jr.	Bus.,'32	Glenside
Girdler, Joseph Hayes	E.M.,'30	Sewickley
Girdler, Tom Mercer, Jr.	Eng.,'33	Sewickley
Girtanner, Robert Edward	Bus.,'33	Elizabeth, N.J.
Glace, Kenneth William	Ch.E.,'31	Bethlehem
Glasby, William Edgar	Eng.,'33	New Haven, Conn.
Glick, Elmer William	Arts,'33	Bethlehem
Glotzer, David	Arts.'33	Brooklyn, N.Y.
Glover, John Michael	Ch.E.,'32	St. Mary's
Godkin, Willard Joseph	Eng.,'33	Bethlehem
Goehring, William Henry, Jr.	Bus.,'32	New Brighton
Gohl, Robert Edgar	C.E.,'30	Harrisburg
Gold, Arthur Jack	Bus.,'33	Trenton, N.J.
Gold, Lester Charles	Eng.,'33	Bethlehem
Goldberg, Abraham	Arts,'32	Bethlehem
Goldberg, Joseph Lincoln	Arts,'30	Brooklyn, N.Y.
Goldenberg, David Davis	Arts,'33	New York, N.Y.
Goldsmith, Emil Schott	Eng.,'33	Bernardsville, N.J.
Goldstein, Israel Payson	Arts,'30	East Taunton, Mass.
Goldstein, Meyer Robert	Arts,'32	Scranton
Goodman, Samuel Ben	Bus.,'32	Bethlehem
Goodman, Samuel Harry	Bus.,'31	Bethlehem
Goodwin, Kenneth Wade	I.E.,'30	Millville, N.J.
Gorlin, Abraham Graham	Bus.,'32	Jersey City, N.J.
Gorman, Edward Thomas	Bus.,'30	Allentown
Gormley, Edward Martin	M.E.,'32	Hazleton
Goyne, Ralph Carol	Eng.,'33	Ashland
Graff, George Fait	Arts,'30	Greensburg
Grafton, Herbert Sidney	Eng.,'33	Trenton, N.J.
Graham, Arthur Lewis	Bus.,'33	Buffalo, N.Y.
Graham, Edward Clark	Bus.,'33	Newburgh, N.Y.
Graham, Merle James	Bus.,'32	Pittsburgh
Grande, Harold Dominik	Eng.,'33	Edgewater, N.J.
Grauer, Bernard	Arts,'32	New York, N.Y.
Graziani, Orlando	Eng.,'33	Parli, Italy
Grebinger, John Kauffman	Eng.,'33	Millersville

Green, Charles Everard Joseph	Ch.E.,'32	Duluth, Minn.
Green, Fulton Merwyn	Arts,'33	Paterson, N.J.
Green, William Jennings	M.E.,'30	Baltimore, Md.
Greene, John Philip	I.E.,'32	Keeseville, N.Y.
Greenstein, Albert	Arts.'33	Brooklyn, N.Y.
Greenstein, Charles Edward	Arts,'32	Suffern, N.Y.
Greetzman, David Joseph	Arts,'32	Brooklyn, N.Y.
Gregg, Stephen Lincoln	E.E.,'31	Washington, D.C.
Gregory, James Allen	Bus.,'33	Newport, Ark.
Griesinger, William Kenneth	Ch.E.,'32	Plainfield, N.J.
Griffith, Arthur Franklin	E.E.,'30	Catasauqua
Griffith, David Pendril	E.E.,'30	Catasauqua
Grimes, Howard Becker	C.E.,'31	Womelsdorf
Grinevich, Joseph John	E.E.,'32	Mahanoy City
Grubbe, David James	Bus.,'31	West New Brighton, N.Y.
Grudin, Abraham	Arts,'33	Newark, N.J.
Grusetz, David	Arts.'33	Brooklyn, N.Y.
Guyer, Evan Henry	Eng.,'33	Buffalo, N.Y.
Haag, Vaughan	Arts,'30	Philadelphia
Haas, Manfred Jacques	Ch.E.,'32	New York, N.Y.
Haas, William Augustus Sebastian	Eng.,'33	Freeport, N.Y.
Haff, Donald Wilson	Arts,'32	Northampton
Hagedorn, Ernest Walter	Bus.,'32	Spring Valley, N.Y.
Hagstoz, George Swan	Eng.,'33	Riverton, N.J.
Halbert, Allen Hyer	Bus.,'33	Kew Gardens, N.Y.
Halbreich, Gerald Joel	Arts,'33	Brooklyn, N.Y.
Haldeman, John Henry	Bus.,'31	Upper Darby
Hale, Henry Hurlburt	Bus.,'33	West Hartford, Conn.
Hall, Harry Eugene, Jr.	Bus.,'33	Scranton
Hall, John Edwin	Eng.,'33	Bethlehem
Hall, John Newton	Arts,'30	Carlisle
Hall, Samuel Lindsay	Ch.E.,'31	Hackensack, N.J.
Hallock, Hadley Alden	Bus.,'30	Palmerton
Halpern, Benjamin	Arts,'33	Newark, N.J.
Halsted, Charles Freeman, Jr.	Bus.,'33	Somerville, N.J.
Hamburger, Bernard Robert	Arts,'30	New York, N.Y.
Hamburger, Louis Benjamin Gerard	Bus.,'31	Mount Vernon, N.Y.
Hammond, Arthur LeRoy	Eng.,'33	Brooklyn, N.Y.
Hammond, Blake Beverly	Arts,'33	Easton, Md.
Hamp, John Wilson	E.E.,'32	Staunton, Va.
Hanna, Samuel James	Bus.,'33	Swarthmore
Hansen, Christian Leonard	Arts,'33	Brooklyn, N.Y.
Harding, Clyde Albert	Arts,'31	Pen Argyl
Hargan, Frederick Dobson	C.E.,'31	Bayonne, N.J.
Harleman, Samuel Thomas, Jr.	Bus.,'33	Bethlehem
Harley, Dudley Lee	Arts,'30	Martinsburg, W.Va.

Harris, George Alexander	Bus.,'32	Scranton
Harris, Robert Harris	E.E.,'31	Narberth
Harris, William	Bus.,'33	New York, N.Y.
Harrison, Clifford Earl, Jr.	Eng.,'33	Philadelphia
Harrison, John Sidney	Met.,'31	Oakmont
Harrower, Wilbur Parkhurst	Bus.,'32	Plainfield, N.J.
Hart, John Henry	Eng.,'33	Bethlehem
Hart, William Winebidelle Phillips	Eng.,'33	Bethlehem
Hartman, Brooks Rapp	Arts,'30	Allentown
Hartman, James Busse	M.E.,'31	Allentown
Hartman, Paul	C.E.,'32	New York, N.Y.
Harwood, Thomas James, Jr.	C.E.,'30	East Islip, N.Y.
Hawkins, Henry Price	Eng.,'33	Salem, N.J.
Hawkins, Thane Edwin	M.E.,'31	Harrisburg
Hazen, John Mercer	Eng.,'33	Bethlehem
Healy, Evans Maitland	E.E.,'30	Minneapolis, Minn.
Heffner, Joseph Heming	Bus.,'32	Wyomissing Hills
Heilman, James Martin	E.E.,'30	Harrisburg
Heim, Frederick Albert	Arts,	Bethlehem
Heinly, David Maguire	Eng.,'33	Allentown
Heller, Irving Richmond	Bus.,'33	New York, N.Y.
Heller, James	Bus.,'32	Far Rockaway, N.Y.
Helms, Arthur Parker	Arts,'30	Brooklyn, N.Y.
Hemingway, Ellsworth Lowel	Eng.,'33	Bridgeport, Conn.
Hemphill, Charles Williams	M.E.,'31	Philadelphia
Hendlin, David Drescott	Arts,'30	New York, N.Y.
Henrichs, Mark Willis	Eng.,'33	Pottstown
Heppenstall, Walter Leonard	Bus.,'33	Bala-Cynwyd
Herb, Probert Edwards	Arts,'33	Luzerne
Herbruck, Robert Ashton	E.E.,'30	Dayton, O.
Herman, Lester Carl	E.E.,'30	Easton
Herman, William Emanuel	Bus.,'32	York
Hersberger, Marshall Davis	Eng.,'33	Sellman, Md.
Hertslet, Victor Beardsley	Arts,'33	Rowayton, Conn.
Hertzog, Rudolph Henry	Eng.,'33	Bethlehem
Heske, Paul Randolph	Eng.,'33	Bethlehem
Hess, Richard Samuel	Bus.,'33	Bethlehem
Hess, Robert Graves	M.E.,'31	Dallas
Hewitt, James Richard, Jr.	Met.,'31	Baltimore, Md.
Hewitt, Leslie Randall	C.E.,'30	Ocean View, N.J.
Heyman, Milton Lawrence	Bus.,'31	Danbury, Conn.
Hickman, Paul	C.E.,'30	Arlington, N.J.
Hickman, William DeForest	Eng.,'33	Arlington, N.J.
Hicks, Vernet Nelson	Eng.,'33	Wharton, N.J.
Hildebrant, James Armstrong	Eng.,'33	Dallas
Hildum, Edward Barkdoll	M.E.,'32	Plainfield, N.J.
Hill, Frank Patterson, Jr.	Bus.,'30	Philadelphia
Hillson, Raymond Henry	Bus.,'33	Brookline, Mass.
Himsworth, Winston Edge	Eng.,'33	Flushing, N.Y.

Hindson, Theodore Phillip	Ch.E.,'31	Freeland
Hinkle, Harold Eugene	Eng.,'33	Bethlehem
Hinman, Kenneth Russell	I.E.,'31	Plainfield, N.J.
Hirshberg, Harold	Bus.,'33	New York, N.Y.
Hoag, Robert Chester	Arts,'30	Newark, N.J.
Hoaster, Russell Eugene	Bus.,'31	Lebanon
Hobbs, John Wallace	Eng.,'33	Brooklyn, N.Y.
Hobson, Joseph Mansfield	Bus.,'31	Philadelphia
Hochman, Nathan	Arts,'33	Brooklyn, N.Y.
Hoehn, Walter George	E.E.,'32	Bogata, N.J.
Hoffman, George Nathaniel	Eng.,'33	Tampa, Fla.
Hoffman, Richard Joseph	Arts,'30	Allentown
Holahan, John James	E.M.,'32	Reading
Holtzman, Stephen Robert	C.E.,'32	Hastings-on-Hudson, N.Y.
Holzshu, John Henry	Bus.,'31	Cumberland, Md.
Homsher, Joseph Bert	I.E.,'31	Strasburg
Honig, Emanuel Aaron	Arts,'31	Newark, N.J.
Horn, Woodrow Washington	Eng.,'33	Bangor
Horne, Arthur Welch	M.E.,'32	Plainfield, N.J.
Horner, Hugh	Bus.,'30	Bath
Hottinger, Edwin Jack	Met.,'32	Kenvil, N.J.
Hottle, George Austin	Ch.E.,'32	Bethlehem
Hough, John Beekman	Arts,'33	New York, N.Y.
Houston, James Homer	Bus.,'32	West Grove
Hoyer, William Ellison	Arts,'31	Glen Ridge, N.J.
Hoyt, Alvord	Bus.,'33	New Haven, Conn.
Hoyt, Harry Wibert	Bus.,'33	Danbury, Conn.
Hoyt, Stuart MacNee	Bus.,'33	Pennington, N.J.
Hudak, Stephen Andrew	Eng.,'33	Allentown
Hughes, Joseph Graham	Eng.,'33	Bellefonte
Hull, Carl Firman	Bus.,'32	East Orange, N.J.
Hunoval, Joseph Andreas	Bus.,'32	Irvington, N.J.
Hunt, George Edward	Bus.,'31	East Orange, N.J.
Huntington, Levin Baker, Jr.	E.E.,'32	Annapolis, Md.
Huntoon, Calvin Brewer	Bus.,'31	Swarthmore
Huot, Allen Leon	Arts,'33	Hudson Falls, N.Y.
Hurley, Richard Wilton	Ch.E.,'30	Belmar, N.J.
Hutchins, William Joseph	Bus.,'30	East Orange, N.J.
Hutchinson, George Cass, Jr.	Eng.,'33	Sewickley
ImHof, Rudolph Emanuel	C.E.,'32	Reading
Isecovitz, Sondell Coleman	Bus.,'32	Lancaster
Issel, William Ernest	Eng.,'33	Philadelphia
Jackel, William John	Met.,'32	McKeesport
Jackson, Charles Marcellus	Eng.,'33	Philadelphia
Jacobs, Albert Humphrey, Jr.	Bus.,'33	Philadelphia
Jaggard, Henry Brill	Bus.,'31	Berlin, N.J.
James, William Scott	E.E.,'32	East Orange, N.J.
Jampol, Warren Sidney	Bus.,'33	New Rochelle, N.Y.
Jarvis, James Melvile	Bus.,'33	Clarksburg, W.Va.

Jaslow, Seymour Paul	Arts,'31	New York, N.Y.
Jeanson, Charles August, III	Ch.E.,'31	Brooklyn, N.Y.
Jeffries, Joseph, Jr.	E.E.,'31	Hollis, N.Y.
Jenkins, Henry Stothoff	Bus.,'32	Hollinger
Jenny, Ernest Frederick	Eng.,'33	Dumont, N.J.
Jerauld, Herbert Aaron	Arts,'33	Attleboro, Mass.
Jester, George Comegys	I.E.,'31	Delaware City, Del.
Job, Frederick Dwight	C.E.,'31	Scranton
Job, Robert Bertram	C.E.,'30	Nanticoke
Johnson, Albert Cronquist	Arts,'30	Bridgeport, Conn.
Johnson, Daniel Pierson	Bus.,'31	Swarthmore
Johnson, John Edwin	E.E.,'30	Collegeville
Johnson, Warren Stofflet	Bus..'33	Nazareth
Johnston, Richard Boles	Bus.,'31	Atlanta, Ga.
Jones, Edward Jackson	C.E.,'30	Ishpeming, Mich.
Jones, Frank Addison	E.M.,'31	Washington, D.C.
Jones, Gordon Osborn	Bus.,'32	Irvington, N.J.
Jones, Lyle Laughlin, Jr.	I.E.,'30	Greensburg
Jones, Robert Duggan	Ch.E.,'31	Kingston
Jones, Robert Vaughan	Bus.,'30	Brooklyn, N.Y.
Jordan, Lester Earl	C.E.,'31	Allentown
Judd, Pearson Morris	Arts,'31	Scranton
Justice, Preston Gould	Arts,'30	Bethlehem
Kachel, Gerald Joseph	Eng.,'33	Reiffton
Kadel, George Boyer	M.E.,'31	Baltimore, Md.
Kadie, Carl Henry, Jr.	Eng.,'33	Chevy Chase, Md.
Kahn, Edward	Arts,'30	Allentown
Kahn, Martin Paul	Arts,'33	New York, N.Y.
Kahn, Milton Walter	Arts,'33	Stamford, Conn.
Kaleda, George Martin	E.E.,32	Mahanoy City
Kantner, Ogden Austin	E.M.,'31	Cresskill, N.J.
Kaplan, Leon	Bus.,'33	Scranton
Kaplan, Morris Elliot	Arts,'31	Hartford, Conn.
Kaplus, Samuel	Arts,'32	Newark, N.J.
Karr, Raymond Arthur	C.E.,'30	West Reading
Kates, Charles Reginald	C.E.,'31	Cape May Court House, N.J.
Kaufman, Jack Henry	Eng.,'33	Wilmette, Ill.
Kaufmann, Emerson Wertz	Ch.E.,'32	Wyomissing
Keady, Thomas Barron	Eng.,'33	Melrose, Mass.
Keck, Frederick Davidson	Bus.,'33	Aspinwall
Keefe, Leo Francis	Arts,'32	Rutland, Vt.
Kehoe, John Edward	Met.,'32	Bethlehem
Keith, Edward Stanley	Arts,'30	Sandy Run
Keller, George Henry	Eng.,'33	York
Keller, Harry Summy, Jr.	M.E.,'30	Bloomsburg
Kellett, William Platt, Jr.	Eng.,'33	New York, N.Y.
Kelley, Walter Harvey, Jr.	Eng.,'33	Bethlehem
Kellner, Theodore Robert	C.E.,'32	Drexel Hill
Kellstedt, Charles Ward	Eng.,'33	Flushing, N.Y.

Kelly, Harry Charles	Phys.,'31	Wilkes-Barre
Kelly, William Dunham, II	C.E.,'30	Philadelphia
Kennedy, Finlay Stewart	Arts,'33	Port Richmond, N Y.
Kennedy, Robert Filler	Eng.,'33	Llanerch
Kerst, Orum Roehrer	Eng.,'33	Caldwell, N.J.
Kesser, Charles Wister	Eng.,'33	Philadelphia
Kessler, Matthew Judah	Eng.,'33	New York, N.Y.
Kessler, Melvin Egbert	Arts,'33	New York, N.Y.
Kieffer, Charles Matthew	Eng.,'33	Philadelphia
Kiep, Julian Anthony	E.E.,'30	Joliet, Ill.
Kimball, James Putnam	Arts,'33	Casper, Wyo.
Kime, Ansley Lewis	E.E.,'31	Belleville, N.J.
King, Charles Preston John	E.E.,'30	Catasauqua
King, Gilbert Westmore	Bus.,'31	Glen Ridge, N.J.
King, Wendell Reuben	Eng.,'33	Richland
Kinsinger, Walter Willis	Eng.,'33	Harrisburg
Kise, Mearl Alton	Ch.E.,'30	Allentown
Kistler, Wilson Stephen	Bus.,'33	Stroudsburg
Klein, August Richard	E.M.,'32	New York, N.Y.
Klein, Leonard	Arts,'32	Brooklyn, N.Y.
Klein, Wilson Goodwin	C.E.,'30	Irvington, N.J.
Kline, Robert Patterson	C.E.,'30	Monongahela
Klippert, Henry Laessle	Bus.,'32	Mountain Home
Knecht, John Elmer	C.E.,'31	Collingswood, N.J.
Knipe, Robert Krauss	Eng.,'33	Philadelphia
Koch, Edward Monroe	Arts,'30	Wyomissing
Koch, George John Joseph	Eng.,'33	Macungie
Koehler, Paul Frederick	Eng.,'33	Pleasantville, N.J.
Kogut, Ludwick Victor	Arts,'31	Bridgeport, Conn.
Kolyer, Franklin Adee	Eng.,'33	Summit, N. J.
Koondel, Irving	Arts,'31	Brooklyn, N.Y.
Kopelov, David Solomon	Arts,'33	Brooklyn, N.Y.
Kopp, Paul Joseph	Eng.,'33	Allentown
Kost, Kenneth Karl	Arts,'31	Gary, Ind.
Kostenbader, Walter Schmidt	Bus.,'32	Nazareth
Kraeling, Harry Adolph, Jr.	Eng.,'33	Pittsburgh
Kramer, Milton	Arts,'30	Allentown
Kreidler, Carl Lester	C.E.,'30	Bethlehem
Kreitner, Robert John, Jr.	Arts,'33	Buffalo, N. Y.
Kremer, Erich Conrad Gustav	Bus.,'33	Paterson, N.J.
Kriebel, Henry August	C.E.,'32	Allentown
Krone, Robert	Ch.E.,'31	Hackensack, N.J.
Krott, Carl Harry Herbert	C.E.,'31	Reading
Kruger, Paul Lewis	Eng.,'33	Brooklyn, N.Y.
Krusen, Henry Penn	Arts,'32	Farmingdale, N.J.
Kugel, Julian Eli	Bus.,'33	Lawrence, N.Y.
Kugler, Robert Green	Eng.,'33	East Orange, N.J.
Kuklentz, Kenneth LeRoy	Ch.E.,'32	Bethlehem
Kuntz, Stephen Albert	E.E.,'30	Allentown
Kuskin, Harry	Arts,'33	Newark, N.J.

Lackey, Homer Clarkson	Bus.,'33	Coatesville
Laftman, Richard Nicholas	Eng.,'33	Bayonne, N.J.
Laird, Reed Gehret	Met.,'31	Reading
Lamb, Elias Morton, Jr.	E.M.,'31	Natalie
Lanahan, Ellwood Royal	Eng.,'33	Philadelphia
Lancit, Sidney Louis	Arts,'33	Newark, N.J.
Land, Sidney	E.E.,'32	Brooklyn, N.Y.
Landis, Robert Prince	Eng.,'33	Sound Beach, Conn.
Landy, Benjamin Herman	Arts,'33	Philadelphia
Landy, Samuel Henry	Bus.,'31	Philadelphia
Lange, Clement	Eng.,'33	Belmar, N.J.
Langhaar, Henry Louis	M.E.,'31	Allentown
Langhaar, John Williamson	Eng.,'33	Allentown
Laporta, Xavier Vincent	Chem.,'32	Weedville
Larkin, Franklin Jonathan	Arts,'33	Bethlehem
Laschober, Eugene William, Jr.	Eng.,'33	Belvidere, N.J.
Lathrop, William Romeyn	Bus.,'33	Birmingham, Ala.
Latremore, Robert Francis	I.E.,'30	West Orange, N.J.
Latsha, Milton Paul	E.E.,'30	Shamokin
Lawrence, Edward Morris	Bus.,'30	Salem, N.J.
Lawrence, Walter Welling	M.E.,'32	Brooklyn, N.Y.
Laws, Harry Kline	Bus.,'33	Philadelphia
Laws, Llewellyn, Jr.	Arts,'30	Philadelphia
Layton, Daniel John	Arts,'33	Georgetown, Del.
Leach, John Frederick	Eng.,'33	Reading
Leader, John Richard	C.E.,'30	Shamokin
Lebowitz, Hyman	Eng.,'33	Throop
Lee, Edward Alexander	Bus.,'31	San Juan, P.R.
Lee, John Roscoe	Bus.,'31	Kingston
Lee, Robert Peary	Eng.,'33	Meriden, Conn.
Leeds, Charles Frederick Alfred	E.E.,'32	Bethlehem
Legge, Edwin Thomas	Eng.,'33	Bound Brook, N.J.
Lehr, Charles Frederick	Eng.,'33	Stockerton
Lehr, Clarence	Arts,'30	Glendale, N.Y.
Lehr, Herbert	Arts,'33	Glendale, N.Y.
Leibert, Arthur Lancaster	Eng.,'33	Bethlehem
Leitner, Frederick	Arts,'30	Brooklyn, N.Y.
Leitzer, Julius Lawrence	Arts,'32	Brooklyn, N.Y.
Lembeck, Paul Joseph	Bus.,'30	Summit, N.J.
Lentz, Robert Pierce, Jr.	I.E.,'30	Eggertsville, N.Y.
Leraris, Dominic	E.M.,'31	Bangor
Lesser, Wilbert Russel	Bus.,'33	Shenandoah Heights
Lessig, Linwood Glen	Arts,'30	Pottstown
Letowt, Zigmont Joseph, Jr.	Arts,'30	Hazleton
Levenson, Ben	Arts,'33	New York, N.Y.
Levi, Harold Benjamin	Bus.,'32	Nanticoke
Levinson, Sidney David	Bus.,'33	Bradley Beach, N.J.
Levy, Aaron Reuben	Arts,'30	Brooklyn, N.Y.

Levy, Herbert Irving	Arts,'33	New York, N.Y.
Levy, Jacob Joel	Arts,'31	Long Beach, N.Y.
Lewis, George	Arts,'33	Brooklyn, N.Y.
Lewis, Leon	Met.,'30	Reading
Lewis, Monroe Samuel	Arts,'33	Newark, N.J.
Lewis, Philip Cornelius	Phys.,'31	Tenafly, N.J.
Lewis, Raymond Harper	Bus.,'30	Buffalo, N.Y.
Lewis, Thomas Richard, Jr.	Bus.,'31	Jersey City, N.J.
Licciardi, Louis Joseph	Arts,'30	Brooklyn, N.Y.
Lichtenstein, Sidney	Arts,'33	New York, N.Y.
Lieb, Harry	Bus.,'33	Newark, N.J.
Liever, Samuel	Arts,'30	Reading
Liggett, Frank Rohm, Jr.	Eng.,'33	Pittsburgh
Lightner, Emery Roger	Bus.,'33	Irvine
Lilley, Albert Davies, Jr.	Eng.,'33	Elizabeth, N.J.
Lincoln, Robert James	E.E.,'31	South Orange, N.J.
Linguiti, Albert Filbert	Bus.,'33	Brooklyn, N.Y.
Linn, Willis Frederick	Bus.,'32	Tremont
Lippincott, Clement Hysler, Jr.	Eng.,'33	Wilmington, Del.
Lipscomb, Robert Crews	Eng.,'33	Low Moor, Va.
Lipshitz, Leo	Arts,'31	Rockaway Park, N.Y.
Lipsky, Alfred Joseph	Bus.,'33	Troy, N.Y.
Lipstein, Arthur	Arts,'32	Newark, N.J.
Lisker, Abraham Lewis	Arts,'33	Providence, R.I.
Little, James Stuart	Bus.,'32	Pelham Manor, N.Y.
Lloyd, John Armon	Eng.,'33	Wilkes-Barre
Lloyd, Milton Henry	Bus.,'33	Montclair, N.J.
Lloyd, Nicholas Peregrine	Eng.,'33	Philadelphia
Lockhart, Hayden James	Bus.,'32	Parkersburg, W.Va.
Lodge, Richard Aspril	Eng.,'33	Philadelphia
Lohse, John Mueller	Eng.,'33	Glen Ridge, N.J.
Long, Melvin LeRoy	M.E.,'32	Muncy
Loomis, Francis Earl	E.E.,'30	Wilkes-Barre
Lord, Carleton	M.E.,'32	Glenside
Lorson, Frank Edward, Jr.	Eng.,'33	New Rochelle, N.Y.
Lowenstein, Charles Raymond	Arts,'31	Newark, N.J.
Lownie, William Alexander	Bus.,'32	Buffalo, N.Y.
Lowry, William Watt	E.M.,'32	Chicago, Ill.
Lubow, Louis Alan	Ch.E.,'30	Vineland, N.J.
Lunger, Erwood Halsey	Eng.,'33	Philipsburg
Lutzy, Robert Henry	Eng.,'33	Cleveland Heights, O.
Lyman, Richard Patrick	Arts,'30	Hazleton
Lyons, John Martin, Jr.	Bus.,'32	Princeton, N.J.
MacAdam, David Lewis	Phys.,'32	Upper Darby
Macadam, Nathan Griffith	Arts,'32	Catasauqua
Macalady, Joseph William	Eng.,'33	Shamokin
Macartney, John William, Jr.	Bus.,'31	East Orange, N.J.
MacCalla, Willard Arrison	I.E.,'30	Youngstown, O.
MacDonald, Howard Graeme	Bus.,'32	New York, N.Y.
MacDonald, James Thomas, Jr.	Bus.,'32	West Hartford, Conn.

MacDougall, Douglas	Eng.,'33	New York, N.Y.
MacDougall, Willis Clayton	Ch.E.,'32	East Orange, N.J.
MacGillis, Donald John, Jr.	C.E..'31	Jacksonville, Fla.
Macgeorge, William Dean	C.E.,'30	Vineland, N.J.
Magyar, John Joseph	Arts,'32	Bethlehem
Maharay, James Earl	Bus.,'32	Newburgh, N.Y.
Maier, Franz Joseph	M.E.,'31	Royersford
Malan, John Clark	Arts,'33	Hudson Falls, N.Y.
Malmros, Alf	Phys.,'31	Roslyn Heights, N.Y.
Mango, Wilfred Gilbert	Arts,'32	Woodcliff, N.J.
Manning, Streckfus William	Bus.,'31	Bronxville, N.Y.
Many, Robert Howland, Jr.	I.E.,'30	Bayonne, N.J.
Marcus, Leonard Charles	Bus.,'30	Atlantic City, N.J.
Marino, Salvatore Charles	Arts,'32	New York, N.Y.
Marks, Charles Edwin, Jr.	M.E.,'32	Yonkers, N.Y.
Marks, David, Jr.	Arts,'32	Newark, N.J.
Marshall, John Thompson	M.E.,'30	Langhorne
Marvel, Albert James	Eng.,'33	Easton, Md.
Mason, William Daniel, Jr.	Eng.,'33	Wallingford
Masters, Donald Smith	Eng.,'33	Pittston
Matchett, Thomas Webster	M.E.,'31	Passaic, N.J.
Mathews, George Eugene	Eng.,'33	Norwalk, Conn.
Mathisen, George Shimer	E.E.,'31	Philadelphia
May, Donald Henry	Ch.E.,'32	Hazleton
Mayberry, William McCandless	Bus.,'32	Philadelphia
Mayer, Hyman	Arts,'31	Brooklyn, N.Y.
Mayer, Jerome	Arts,'32	New York, N.Y.
Mayo, Robert Bass	Eng.,'33	Takoma Park, D.C.
McAlarney, John Charles, Jr.	Bus.,'30	Plymouth
McBride, Charles Rhodes	Met.,'31	Oakmont
McCandless, Andrew Fell	Bus.,'33	Haverford
McCarthy, Frank Joseph, Jr.	Bus.,'31	Bethlehem
McClain, John Francis	M.E.,'31	Lancaster
McClellan, Samuel Griffin, Jr.	Eng.,'33	Mount Vernon, N.Y.
McConahey, Hugh Milner	Eng.,'33	Wilkinsburg
McConnell, Edward Clark	Arts,'31	Williamsport
McCrea, Edward James	M.E.,'32	Passaic, N.J.
McCurley, William Stran, Jr.	Bus.,'31	Baltimore, Md.
McElroy, Alexander Thomas	C.E.,'31	Corona, N.Y.
McElwain, John Stanley	Eng.,'33	Sewickley
McGarrity, William Fisher	Ch.E.,'31	Youngstown, O.
McGovern, John Joseph	Eng.,'33	Bethlehem
McHugh, Edward Joseph	Eng.,'33	Philadelphia
McLachlan, John, Jr.	Bus.,'30	East Elmhurst, N.Y
McLaughlin, Conrad	E.E.,'30	Philadelphia
McLean, Harry Laurance	Ch.E.,'32	Scranton
McLean, Robert Rettie	Arts,'30	Jersey City, N.J.
McLernon, Joseph Francis	Arts,'31	Bethlehem
McMullen, John Gates	Bus.,'32	Maplewood, N.J.

McNally, Edward Mitchell	Eng.,'33	New York, N.Y.
McNeil, Alfred Mason	Bus.,'32	Philadelphia
Mealey, William Francis	E.M.,'32	Allentown
Mears, Harry Albert	Bus.,'33	Greensburg
Meharg, John George	Arts,'31	Hamburg
Mele, Sidney Charles	Arts,'32	Brooklyn, N.Y.
Merritt, George Jester	Eng.,'33	Wilmington, Del.
Mertz, John Clewell	Ch.E.,'31	Allentown
Mestre, Abel	Bus.,'32	Santiago, Cuba
Metzgar, Russell Eugene	Eng.,'33	Nazareth
Metzger, Malcolm Thomas	Arts,'31	Bethlehem
Meyers, Edwin Truman	Ch.E.,'31	Red Lion
Meyers, Harry Cyril, Jr.	Arts,'31	New York, N.Y.
Michael, Henry Edward	C.E.,'30	Holtwood
Milgram, Albert	Arts,'33	Philadelphia
Millelot, Leon Sylvester	Ch.E.,'31	Lyndhurst, N.J.
Miller, Carl Andrew	E.M.,'32	Staten Island, N.Y.
Miller, Donald	C.E.,'32	Scranton
Miller, Dustin Yach	Ch.E.,'30	Lyndhurst, N.J.
Miller, Edward Julius	Bus.,'33	Port Washington, N.Y.
Miller, Harry	Arts,'31	Bethlehem
Miller, Henry	Arts,'33	Bethlehem
Miller, James Francis	E.E.,'31	Tarentum
Miller, Jerold George	Arts,'32	Bethlehem
Miller, Lawson Hawkins	Bus.,'32	Newburgh, N.Y.
Miller, Nathan	Arts,'32	Bethlehem
Miller, Oscar Ralph	Arts,'30	Brooklyn, N.Y.
Miller, Sydney	Eng.,'33	Newark, N.J.
Miller, William Edward, Jr.	Bus.,'30	Baltimore, Md.
Miller, William Francis	Eng.,'33	Easton
Miller, William Schuyler	Chem.,'30	Allentown
Miller, Winton Lucius, Jr.	Bus.,'32	Princeton, N.J.
Mills, William Wirt, Jr.	Bus.,'33	Staten Island, N.Y.
Milson, Charles Alfred	Arts,'32	Catasauqua
Minifie, Benjamin	Arts,'33	Belleville, N.J.
Minsker, John Henry	C.E.,'31	East Aurora, N.Y.
Minskoff, Emanuel Ellington	Arts,'32	New York, N.Y.
Mintz, Gerald Emanuel	Eng.,'33	Allentown
Mitchell, George Henry, Jr.	I.E.,'32	New York, N.Y.
Mitchell, Grable Harry	Eng.,'33	Washington, D.C.
Mochamer, Thomas Richard	Eng.,'33	Centralia
Mommers, Theodor Wallace	Eng.,'33	Baltimore, Md.
Monness, Abbot Ross	Arts,'32	New York, N.Y.
Monroe, Stuart Alexander	Bus.,'30	Hazleton
Monsell, John Reginald	M.E.,'30	Greenport, N.Y.
Montenecourt, Jean Antoine	Met.,'32	Cranford, N.J.
Montgomery, George Morton	Eng.,'33	Philadelphia
Moomy, Richard Eugene Llewellyn	Bus.,'33	Carlisle
Moorhead, Herman Alexander	Met.,'32	Buffalo, N.Y.

Moorhead, Robert White, Jr.	Eng.,'33	Harrisburg
Mor, Maurice Franklin	Bus.,'33	Irvington, N.J.
Morgan, Cyril Charles	Bus.,'33	Roanoke, Va.
Morgan, Robert Vincent	Bus.,'33	Bethlehem
Morhart, Frederick Henry	Arts,'31	Washington, D.C.
Morris, Francis Maylum	E.M.,'32	Lansdale
Morton, Donald Douglas	C.E.,'31	Woodhaven, N.Y.
Moses, Harlan Taft	Bus.,'32	Providence, R.I.
Motion, Robert	C.E.,'31	Madison, N.J.
Motter, George Frederick, Jr.	I.E.,'30	York
Mount, Norman	Eng.,'33	Allenhurst, N.J.
Mount, Wilbur Shepherd	M.E.,'31	Princeton, N.J.
Moyer, Willard Mohr, B.S. *(Ursinus College)*	C.E.,'30	Quakertown
Mozes, Adolph	Eng.,'33	Bethlehem
Mueller, William Fred	Eng.,'33	Jersey City, N.J.
Muendel, Harold John	Ch.E.,'30	Woodcliff, N.J.
Muldberg, Philip Raymond	Arts,'30	New York, N.Y.
Mumford, Charles Edward, Jr.	Eng.,'33	Willards, Md.
Murphey, John Nichols	Eng.,'33	Kerhonkson, N.Y.
Murphy, Matthew John	Arts,'33	Atlantic Highlands N.J.
Murray, Francis Aloysius	C.E.,'32	New Haven, Conn.
Murray, Henry Kedward	Bus.,'32	Philadelphia
Myer, J. Leland	Phys.,'30	Leola
Myers, James	Bus.,'33	Bethlehem
Myers, Philip Benham	Arts,'32	Kingston
Myers, Richard Small	Arts,'30	York
Myers, Robert Julius	Eng.,'33	Elkins Park
Myers, Robert Lee, Jr.	Bus.,'30	Linwood, Md.
Myers, Woolmer Wood	Bus.,'31	Philadelphia
Myra, Ellen Esekeil	Ch.E.,'31	Lunenburg, N.S., Canada
Nadler, Marriott Robert	Arts,'33	Trenton, N.J.
Nairin, Jack Lee	Bus.,'32	Louisville, Ky.
Napravnik, Joseph	Ch.E.,'32	Freemansburg
Narzisi, Filadelfio	E.M.,'32	Bethlehem
Nassau, Charles Francis, Jr.	Arts,'32	Philadelphia
Naulty, Albert Albee	Bus.,'33	Perth Amboy, N.J.
Neel, Percy Landreth, Jr.	Bus.,'33	Merion
Nelson, Arnold Wilhelm	Met.,'32	Westerleigh, N.Y.
Nemetz, Carl Joseph	Bus.,'31	Port Chester, Conn.
Neudoerffer, Albert Lewis	Met.,'32	Phoenixville
Neuwirth, Francis	Arts,'31	Brooklyn, N.Y.
Nevins, Hugh	Chem.,'31	Hokendauqua
Newcomb, Thomas Warwick	Eng.,'33	Long Branch, N.J.
Newell, William Ellsworth	Eng.,'33	Somerville, N.J.
Newhard, Henry Thomas	Ch.E.,'32	Fullerton
Newman, Samuel Joseph	Bus.,'33	Nutley, N.J.
Nichols, David Perry	Eng.,'33	Pennington, N.J.

Nichols, John Perry	Eng.,'33	Pennington, N.J.
Nickowitz, Harry Samuel	Arts,'32	Newburgh, N.Y.
Niehaus, Raymond Martin	I.E.,'32	East Orange, N.J.
Nisbet, George Porter	M.E.,'31	Pittsburgh
Nisbet, Robert Alexander	Eng.,'33	Pittsburgh
Noedel, Ernest Henry	E.E.,'31	Reading
Nora, Thomas Edward	C.E.,'32	New Brunswick, N.J.
Oberstein, Melvin Bernard	Bus.,'32	Allentown
Obert, Horace Dickinson	Arts,'31	Lehighton
O'Brien, Harry Joseph, Jr.	Eng.,'33	Deal, N.J.
O'Brien, Robert Lee, Jr.	Eng.,'33	Washington, D.C.
O'Connell, John Charles, Jr.	E.E.,'30	Hagerstown, Md.
Oest, William Theodore	Bus.,'33	Jersey City, N.J.
Ogden, Gordon Prentiss	Bus.,'30	Great Neck, N.Y.
Ogden, John Wilson	I.E.,'32	East Orange, N.J.
Oldham, John Edwin	E.M.,'32	Greenwich, Conn.
O'Leary, Frazier Lewis, Jr.	Bus.,'31	Dorchester, Mass.
Oller, George Ellis, Jr.	M.E.,'30	Philadelphia
Olmsted, Edward Stanley	Arts,'30	Burnside, Conn.
Olney, Richard Holden	Bus.,'33	Lowell, Mass.
Ondeck, Gabriel Martin	Arts,'30	Hazleton
O'Neill, John, Jr.	Bus.,'31	Tenafly, N.J.
Opp, George Sandt, Jr.	C.E.,'30	Philadelphia
Oppenheim, Miles Auranus	Bus.,'31	South Orange, N.J.
Oppenheimer, Henry, Jr.	Arts,'30	New York, N.Y.
Oram, John Fisher	Eng.,'33	Bethlehem
Osborn, Daniel Cargill, Jr.	Arts,'32	Honesdale
Osborn, Harry Brooks, Jr.	Ch.E.,'32	Newark, N.J.
Oser, Felix	Eng.,'33	Philadelphia
Otto, Olaf, Jr.	Eng.,'33	Savannah, Ga.
Ousey, Harry Haley	C.E.,'31	Philadelphia
Overfield, Budd	C.E.,'30	Bethlehem
Paget, Francis King	M.E.,'30	Flushing, N.Y.
Pailey, Louis	C.E.,'30	Williamstown
Papa, Joseph Charles	Arts,'33	Philadelphia
Parkhurst, Howard Oscar	Bus.,'33	Orange, N.J.
Parsons, George Wellman	Arts,'32	Philadelphia
Parsons, John Leonard	Bus.,'32	Troy
Partridge, Seymour Truman	Eng.,'33	Northville, N.Y.
Patterson, George Denison	Arts,'32	Huntington, W.Va.
Patterson, George McKeown	Arts,'31	Philadelphia
Peabody, Howard Waite	Bus.,'33	Norwalk, Conn.
Pearre, Oliver Jackson	M.E.,'31	Baltimore, Md.
Peck, Clarence Bardwell, Jr.	Eng.,'33	Charleston, W.Va.
Pellizzoni, Alvin Remo	Arts,'33	Allentown
Pennington, Richard Armstrong	Eng.,'33	Vandegrift
Pennington, Robert Janvier	Eng.,'33	Trenton, N.J.
Pentz, Harold Henry	Eng.,'33	Bethlehem
Perlman, Harold Wilber	Bus.,'33	Newark, N.J.

Perlmutter, Herbert Merwin	Bus.,'31	Newark, N.J.
Persons, Henry Williamson	Bus.,'33	East Aurora, N.Y.
Petillo, John Anthony	Arts,'33	Red Bank, N.J.
Pflaumer, Arthur Eugene	Ch.E.,'32	Philadelphia
Pflaumer, George Monroe	Eng.,'33	Philadelphia
Phelps, Edward Stanley	E.E.,'30	Rockville Center, N.Y.
Phillips, Harold	Arts,'30	Bethlehem
Phillips, Robert Roth	M.E.,'32	Pittsburgh
Phillips, Robert Wilgus	Eng.,'33	Bayonne, N.J.
Pierce, Donald Charles	Bus.,'33	Paterson, N.J.
Pimper, Charles William, Jr.	Ch.E.,'32	Chevy Chase, Md.
Pinkerton, James Buckingham	Arts,'33	City Point, Fla.
Pinkney, Oliver Brayton	Bus.,'33	Montclair, N.J.
Platsky, Samuel Jacob	Bus.,'32	Wilkes-Barre
Platt, Charles Henry, Jr.	Bus.,'33	Brooklyn, N.Y.
Platt, Lucien Henry	Bus.,'31	Saranac Lake, N.Y.
Poggi, Edmund Howe, Jr.	Eng.,'33	Wilkes-Barre
Pollack, Abraham	Arts,'32	Brooklyn, N.Y.
Port, William Van Scoyoc	Bus.,'31	Bywood
Porter, Robert Shelly	Eng.,'33	East Northfield, Mass.
Posnak, Louis	Arts,'31	Bayonne, N.J.
Post, Alfred Philip, Jr.	Ch.E.,'31	Philadelphia
Potter, Frank Graham	E.E.,'30	Rockville Centre, N.Y.
Potter, William Townley	Bus.,'33	Elizabeth, N.J.
Powell, William Frederick, Jr.	Bus.,'30	Upper Darby
Powers, Richard Mair	Bus.,'31	Newton Centre, Mass.
Pragnoski, John Felix	Eng.,'33	Shenandoah
Pratt, Henry Gilbert, Jr.	C.E.,'30	Washington, D.C.
Pratt, Stanley Winter	Arts,'30	Nanticoke
Pratt, William Abbott, Jr.	Arts,'31	Staunton, Va.
Proebstle, Carl Joseph	Bus.,'31	Ventnor, N.J.
Publicker, Theodore	Bus.,'32	Philadelphia
Quigley, Richard Shaw, Jr.	Bus.,'33	Lock Haven
Quinn, Joseph Aloysius	Eng.,'33	Pittston
Rabinowitz, Benjamin	Ch.E.,'32	Scranton
Ramsay, Robert William	Arts,'33	Needham Heights, Mass.
Rankin, Clinton Draper	Bus.,'31	Stratford, Conn.
Ransburg, Walter Townsend	Arts,'32	New York, N.Y.
Ransom, Stephen Webbe	Bus.,'30	Jersey City, N.J.
Rappeport, Leon Irving	Arts,'33	Bloomfield, N.J.
Raring, Robert Holland	E.M.,'32	Harrisburg
Rather, James Burness, Jr.	Ch.E.,'32	Brooklyn, N.Y.
Rauch, Philip	Bus.,'33	Brooklyn, N.Y.
Rawlings, Fred Benjamin	Eng.,'33	Washington, D.C.
Rawn, Andrew Bryson, Jr.	I.E.,'32	Huntington, W.Va.
Reed, George Douglas	Eng.,'33	Baltimore, Md.
Reed, Martin Monroe, Jr.	Arts,'33	Bethlehem
Reed, Samuel Burritt	Eng.,'33	Kingston

Reese, Robert Morris	Bus.,'30	Kingston
Regar, Philip Waters	Eng.,'33	Collegeville
Reilly, Walter Reese	Eng.,'33	Kingston
Repa, George John	Arts,'33	Kingston
Resetco, George James	Arts,'32	Bethlehem
Reynolds, Peter Graham	M.E.,'32	Bethlehem
Reynolds, Thomas Bernard	Eng.,'33	Phillipsburg
Rhoades, William Taylor	Bus.,'33	West Point, N.Y.
Rhoads, James Crisman	Eng.,'33	Harrisburg
Rhodes, Floyd Maxwell, Jr.	I.E.,'32	Westfield
Ricards, Atwood Jester	Eng.,'33	Marshallton, Del.
Richardson, Lincoln Thomas	Bus.,'31	Demarest, N.J.
Riedy, Ethelbert Augustus Richard	Ch.E.,'32	Allentown
Rights, Fred Lewis	Eng.,'33	Bethlehem
Rigling, Vance Fager	Eng.,'33	New Cumberland
Riley, George Hempstead	Bus.,'33	Hagerstown, Md.
Rinker, Kenneth Keiser	M.E.,'32	Catasauqua
Ritter, Stewart Elwood, Jr.	I.E.,'32	Allentown
Riviere, Burt Henry	Bus.,'33	Thornburg
Robar, Henry John	Eng.,'33	Bethlehem
Robb, Alexander Duffield, Jr.	Bus.,'33	Grand Island, N.Y.
Robb, Edward Haupt	Bus.,'33	Grand Island, N.Y.
Roberts, Edwin Raphael	E.E.,'30	Mahanoy City
Roberts, Harold C.	E.M.,'31	Carthage, N.Y.
Roberts, Lynn Croll	Eng.,'33	Buffalo, N.Y.
Robinson, Richard Rogers	Arts,'31	Trenton, N.J.
Robson, Charles Howard	C.E.,'32	Lansdowne
Rochester, James Fountain	Eng.,'33	Philadelphia
Rochlin, Julian	Arts,'33	Stamford, Conn.
Rock, John Hampton	Eng.,'33	Fairmont, W.Va.
Roeber, William Henry	Bus.,'33	Irvington, N.J.
Roeder, John Seymour	Bus.,'32	Richmond Hill, N.Y.
Roessle, James Jackson	Arts,'33	Pittsburgh
Rogers, Alfred Nathan	Ch.E.,'30	Reading
Rogers, Paul Wellington	Eng.,'33	Asbury Park, N.J.
Rohrer, Frederick Findlay, Jr.	Eng.,'33	Pittsburgh
Rohrs, Arthur George	I.E.,'32	Ridgewood, N.J.
Rohrs, Henry	Bus.,'30	Ridgewood, N.J.
Roll, Richard Gustave	Arts,'33	East Orange, N.J.
Rorty, Philip Adams	Bus.,'33	Goshen, N.Y.
Rosalsky, Maurice Binion	Arts,'32	New York, N.Y.
Rosen, Louis	Arts,'31	Baltimore, Md.
Rosenbaum, Edward Morris	Ch.E.,'32	New York, N.Y.
Rosencrans, Charles Arthur	E.E.,'31	Warwick, N.Y.
Rosenthal, David Barry	Arts,'33	Reading
Rosenwasser, Sidney Robert	Arts,'33	New York, N.Y.
Ross, Edwin Morrison	Ch.E.,'32	Philadelphia
Ross, Lawrence Campbell	Bus.,'33	Loch Arbour, N.J.
Roth, William Oscar	Bus.,'32	New Rochelle, N.Y.

Rothenberg, Joel Elmer	Arts,'32	Brooklyn, N.Y.
Rothenberg, Nathaniel Shomer	Arts,'33	New York, N.Y.
Rotthaus, Walter Edmund	Bus.,'30	Allentown
Rounds, Sterling William	Bus.,'30	Cleveland, O.
Roy, Robert Merton	Eng.,'33	Sussex, N.J.
Rozelle, Arlington Laverne	E.E.,'31	Carbondale
Rubin, William	Bus.,'33	New York, N.Y.
Ruch, Richard Karl	Eng.,'33	Allentown
Ruderman, Manuel Leon	Bus.,'33	Somerville, N.J.
Rudnick, Gilmore	Arts,'33	North Adams, Mass.
Ruffer, Harry Herman	Eng.,'33	Westfield, N.J.
Ruggles, Harry Wyndham, Jr.	Arts,'32	Kingston
Rupley, William Ramsburg	Bus.,'33	Grand Rapids, Mich.
Rushong, Frank Anders	Met.,'32	Collegeville
Russo, Rudolph Louis	Arts,'33	Brooklyn, N.Y.
Rust, George Mooar	M.E.,'31	Birmingham, Ala.
Rustay, Arnold Luther	Eng.,'33	Wilkes-Barre
Ryan, James Kenneth	Bus.,'32	Schenectady, N.Y.
Rynkiewicz, Edward Felix	Eng.,'33	Tamaqua
Sachs, William Howard	Bus.,'32	Binghamton, N.Y.
Sadtler, Philip	Eng.,'33	Philadelphia
Saffer, Sidney Hugh	Arts,'32	Brooklyn, N.Y.
Sahm, Henry Spencer	Bus.,'31	Scranton
Saler, Harold Benjamin	Arts,'32	Philadelphia
Salwen, Robert	Arts,'33	Brooklyn, N.Y.
Salz, Jacque Ashley	Arts,'33	New York, N.Y.
Samuels, Bernard Edwin	Arts,'32	Brooklyn, N.Y.
Sanford, John Wallace	Eng.,'33	Rochester, N.Y.
Sanna, Alfred Anthony	Bus.,'31	Pen Argyl
Satz, Leonard	Arts,'33	Lawrence, N.Y.
Saunders, Henry Kerr	Eng.,'33	Newark, N.J.
Savage, Rufus Llewellyn, Jr.	Ch.E.,'31	Asbury Park, N.J.
Savage, Thomas Austin	Eng.,'33	Asbury Park, N.J.
Savastio, Edward Henry	C.E.,'31	Philadelphia
Sawyer, Donald Stanley	Arts,'32	Bethlehem
Sawyer, John Sherman	C.E.,'31	Bethlehem
Saxtan, Burton Webster	Bus.,'32	Jersey City, N.J.
Scavo, James Anthony	C.E.,'30	Old Forge
Schacht, Edward Lawrence	Bus.,'32	Flushing, N.Y.
Schaffer, Irving	Arts,'31	Brooklyn, N.Y.
Scharfenberg, Chatwin Ambrose	Eng.,'33	East Rockaway, N.Y.
Schaub, Warren Howard	E.E.,'31	Freeland
Schaumburg, George John	C.E.,'31	Reading
Scheer, Henry Conrad, Jr.	Eng.,'33	Glen Ridge, N.J.
Scheinberg, Lawrence	Arts,'32	New York, N.Y.
Schenck, Joseph Dennis	Arts,'33	New York, N.Y.
Schenck, Mead, Jr.	Arts,'33	West Pittston
Schermer, Isador	Ch.E.,'31	Bethlehem
Schick, Herman Anthony	Arts,'30	Rosebank, N.Y.

Schier, Carl Frederick, Jr.	M.E.,'32	Ellicott City, Md.
Schilling, Murray Courtwright	Bus.,'32	Clark's Summit
Schneck, Karl Roy	Eng.,'33	Allentown
Schneider, Harvey Louis	Bus.,'33	Rockville Centre, N.Y.
Schneider, John Wesley	Phys.,'32	Lancaster
Schoen, George Lloyd	Ch.E.,'30	Detroit, Mich.
Schoenhut, George Weber	Arts,'30	Philadelphia
Schooley, David Nixon	Bus.,'33	Trucksville
Schroeder, Jacob Weiskircher	Met.,'31	McKeesport
Schuck, William Mitchell	C.E.,'32	Philadelphia
Schultz, Irving	Arts,'32	Newark, N.J.
Schultz, Max	Arts,'30	Philadelphia
Schumaker, Frederick Lebbeus	I.E.,'30	Philadelphia
Schuyler, Elmer VanNess	I.E.,'32	Upper Darby
Schwartz, Arthur	Eng.,'33	Allentown
Schwartz, Fred Jerome	Arts,'33	New York, N.Y.
Schwartz, Harold Milton	Arts,'30	Brooklyn, N.Y.
Schwartz, Isaac	Arts,'32	Long Beach, N.Y.
Schwartz, John Francis	C.E.,'32	Allentown
Schwartz, Sanford	Arts,'33	New York, N.Y.
Schwenk, Walter Louis, Jr.	Ch.E.,'32	Allentown
Scoblionko, Emanuel George	Arts,'31	Bethlehem
Scofield, Francis Collins	Chem.,'31	Lanham, Md.
Scott, Frank Rutter, Jr.	Bus.,'31	Glenside
Seabrook, Charles Courtney	C.E.,'32	Bridgeton, N.J.
Seal, Paul Wesley	E.E.'31	Factoryville
Seaton, Wesley Hughes	Bus.,'30	Oil City
Secor, Andrew Reynolds	Ch.E.,'30	Scarborough, N.Y.
Seeburger, William	E.M.,'32	Philadelphia
Seiden, Leon	Bus.,'31	Lakewood, N.J.
Seiler, Edwin William	Eng.,'33	South Orange, N.J.
Seligson, Julius	Bus.,'30	New York, N.Y.
Semar, Harold Walls	M.E.,'30	Philadelphia
Serber, Robert	Phys.,'30	Philadelphia
Serfass, Clark Arthur Everett	Eng.,'33	Nazareth
Serfass, Earl James	Eng.,'33	Allentown
Serfass, Raymond Koch	I.E.,'32	Pottsville
Sergott, Edmund Thaddeus	Bus.,'33	Glen Lyon
Seward, Harold Aloysius	Arts,'30	Parkersburg, W.Va.
Shaffer, Abraham	Arts,'33	Brooklyn, N.Y.
Shamenek, Charles Joseph	Bus.,'33	Bethlehem
Shanker, Meyer William	Arts,'32	Brooklyn, N.Y.
Shankweiler, Ray Gernert	E.E.,'32	Allentown
Shannon, Francis Patrick	M.E.,'31	Buffalo, N.Y.
Shannon, Robert Frew	Eng.,'33	Sewickley
Shaw, Franklin Bolton	C.E.,'32	Swedesboro, N.J
Shay, Felix Buckley	E.M.,'31	Baltimore, Md.
Sheen, Robert Tilton	Ch.E.,'31	Philadelphia
Shelhart, John William	Eng.,'33	Cleveland, O.

Shellenberger, William Howard	C.E.,'32	Bayonne, N.J.
Shenton, Dean Amandus	Ch.E.,'30	Slatington
Sherer, Arthur Milton, Jr.	Eng.,'33	Noble
Sherr, Harry	Arts,'33	Allentown
Shindel, William Thomas	Bus.,'31	Scranton
Shimer, Stewart Applegate, Jr.	C.E.,'32	Bethlehem
Shipley, David Gregg	Arts,'33	Hoboken, N.J.
Shipley, Samuel Richards	Arts,'31	Philadelphia
Shoemaker, Francis	Arts,'31	West Conshohocken
Shoemaker, George Richard	C.E.,'31	Pottstown
Shulman, Murray William	Arts,'30	Irvington, N.J.
Siegel, Irving Michael	Arts,'30	New York, N.Y.
Siegrist, Roy Buckwalter	M.E.,'31	Lancaster
Sievering, Howard	E.E.,'32	Maplewood, N.J.
Silver, Harold Irving	Bus.,'33	Hudson, N.Y.
Silverstein, Milton	Bus.,'33	Brooklyn, N.Y.
Simcoe, William Henry	C.E.,'32	Trenton, N.J.
Simes, Rowland James, Jr.	Eng.,'33	Brooklyn, N.Y.
Simmons, Samuel John, Jr.	Arts,'33	New York, N.Y.
Simmons, Sidney Melvin	Arts,'30	Roxbury, Mass.
Simon, Stanley Emanuel	M.E.,'32	Seaford, Del.
Simonson, Lloyd DeForest	E.E.,'30	Hazlet, N.J.
Simpson, William Carl	Eng.,'33	Columbia, N.J.
Sims, Ivor Donald	Eng.,'33	Bethlehem
Sinclair, Alonzo Loraine	Ch.E.,'32	Norristown
Sincock, Harold Edwin	Ch.E.,'31	Sparrows Point, Md.
Sindel, Elias Allie	Arts,'31	Brooklyn, N.Y.
Singer, Harry Frederick	E.E.,'30	Jermyn
Skelly, John Scott, Jr.	Eng.,'33	Monongahela
Skuzinski, Alfred Joseph	Arts,'33	Nanticoke
Slade, Benjamin	Arts,'33	Newark, N.J.
Slaughter, Page Harrison, Jr.	Bus.,'32	East Aurora, N.Y.
Slichter, Charles Byron	Ch.E.,'32	Reading
Sloshberg, Sidney	Arts,'30	Trenton, N.J.
Small, Edward Nicholas	Bus.,'30	Westbury, N.Y.
Smargom, Mom Chow	Bus.,'33	Siam
Smith, Arthur Levern	Ch.E.,'30	Coatesville
Smith, Donald	Bus.,'33	Milford, Del.
Smith, Francis Gerecke	Ch.E.,'32	Newburgh, N.Y.
Smith, Harry Auner	Arts,'31	Brigantine, N.J.
Smith, Jack Warren	Eng.,'33	Warren, O.
Smith, Melchior Harry	Bus.,'31	Columbus, O.
Smith, Robert Clifford, Jr.	Ch.E.,'31	Shawnee
Smits, Rivene Oscar Ferdinand	Eng.,'33	Santiago, Chile
Smoleroff, Jack Arnold	Arts,'33	Newark, N.J.
Snavely, Frank Lichty	Eng.,'33	Lancaster
Snitkin, Sydney Raymond	Arts,'31	New York, N.Y.
Snyder, Edwin Oscar	Eng.,'33	Wyomissing

Snyder, Raymond Eugene	E.E.,'31	Lemoyne
Snyder, Richard Lee, Jr.	Eng.,'33	Glassboro, N.J.
Snyder, William Harry, Jr.	Bus.,'30	Newport
Sobel, Abraham Wilson	Arts,'33	New York, N.Y.
Sobo, Cecil	Arts,'32	Newark, N.J.
Sobo, Leslie Milford	Arts,'31	Newark, N.J.
Sofman, Arthur	Bus.,'32	Newark, N.J.
Solomon, Samuel	Arts,'32	Brooklyn, N.Y.
Somers, William Eugene	Eng.,'33	Catasauqua
Somerville, John Jeffrey	Bus.,'30	Bethlehem
Sommer, Felix Marcus	Bus.,'33	Newark, N.J.
Sones, William Lloyd	E.E.,'32	Pottsville
Sordon, Edward Preston	E.E.,'31	Riverton, N.J.
Sosna, Rudolph Joseph	Bus.,'33	Philadelphia
Spangler, John Earl	C.E.,'30	York
Spath, William Henry	Arts,'32	Hoboken, N.J.
Speck, Robert Edgar	Bus.,'31	Bethlehem
Spector, Morton David	Bus.,'33	Philadelphia
Spector, Sydney Marvin	Arts,'32	New York, N.Y.
Sponsler, John Bernard	E.E.,'31	Williamsport
Sprinz, Bennett Strauss	Bus.,'30	New York, N.Y.
Stabler, Donald Billman	C.E.,'30	Williamsport
Stabler, Robert Allan	C.E.,'31	Williamsport
Stack, Edward John	Arts,'32	Brooklyn, N.Y.
Stanley, Alfred Thomas	Bus.,'32	New York, N.Y.
Staub, Edmund Arthur	Bus.,'30	Millburn, N.J.
Stauffer, Robert Henry	Bus.,'30	Leola
Stay, Charles Albert	E.E.,'30	Locust Valley, N.Y.
Steadman, Christopher, Jr.	Eng.,'33	Hugenot Park, N.Y.
Stedman, Carleton Dexter	Bus.,'33	Brockton, Mass.
Steele, George William, Jr.	Bus.,'33	New York, N.Y.
Steilen, Louis John	Eng.,'33	Brooklyn, N.Y.
Stein, Morton	Bus.,'33	Newark, N.J.
Stein, Victor	Phys.,'30	Bethlehem
Steinert, Bentley Otto	E.E.,'30	Belle Vernon
Stem, Edgar Samuel, Jr.	E.E.,'32	Alderson
Stender, Herman Gilbert	Eng.,'33	Scranton
Stephenson, Jacob William, Jr.	Eng.,'33	Tarentum
Stettler, Willard Beisel	M.E.,'30	Allentown
Stewart, Frederick Fitzgerald	Arts,'31	Tuxedo, N.Y.
Stier, Henry Clay	Eng.,'33	Pittsburgh
Stiles, Morrison Nell	Eng.,'33	Upper Darby
Stine, Thomas P.	Eng.,'33	Auburn
Stineman, Evan Christian	Arts,'31	Johnstown
Stirrett, William Robert	C.E.,'32	Philadelphia
Stocker, Raymond Eugene	E.E.,'30	Easton
Stone, Irving Lester	Arts,'32	New York, N.Y.
Stoneback, Ira Townsend	M.E.,'32	East Orange, N.J.
Storm, Thomas Franklin	I.E.,'30	Pottstown

Stow, Louis Jackson	Met.,'32	Merchantville, N.Y.
Strachan, John David	Eng.,'33	Staten Island, N.Y.
Strausberg, Morris Oscar	Bus.,'33	Brooklyn, N.Y.
Strauss, Morton	Bus.,'31	Philadelphia
Strawn, Thomas Franklin	E.E.,'30	Quakertown
Stroman, Joseph Brobst	Arts,'31	Bethlehem
Strong, John Martin	Bus.,'33	Gloversville, N.Y.
Stupp, Russell William	Eng.,'33	Lemoyne
Stutz, Frank August	Met.,'31	Washington, D.C.
Such, Theodore	Arts,'32	Sayville, N.Y.
Sulken, Herman	Arts,'30	Brooklyn, N.Y.
Sullivan, Arthur Alan	Bus.,'31	Tenafly, N.J.
Sussman, Louis	E.E.,'30	Allentown
Swan, Theodore Homer	Arts,'31	Philadelphia
Swanger, Walter Abram	C.E.,'31	Lebanon
Sweeney, Harold Joseph	Eng.,'33	West Pittston
Sweeny, Ross Fultz	C.E.,'32	Nutley, N.J.
Swoyer, Robert Howard	M.E.,'32	Hazleton
Sykes, Roy Arnold	Bus.,'33	Paterson, N.J.
Sylvester, Robert Arthur	E.E.,'31	Pottsville
Taft, John Rockwell	Bus.,'33	Maplewood, N.J.
Taylor, Gibson Dunlop	Bus.,'31	Syracuse, N.Y.
Taylor, Leonard Myron	Bus.,'30	Newark, N.J.
Taylor, Robert Scott	Eng.,'33	Pottsville
Taylor, William John, Jr.	Eng.,'33	Pottsville
Tempest, James Alvin	Arts,'33	Catasauqua
Templeman, George MacKenzie	Chem.,'32	New Haven, Conn.
TenEyck, Hugh Skillman	Met.,'31	Somerville, N.J.
TenEyck, William Worley	Ch.E.,'30	Washington, D.C.
Thatcher, Samuel Harold	E.M.,'30	Bethlehem
Thomas, Albert Paulding	C.E.,'32	Flushing, N.Y.
Thomas, Allan Morton, Jr.	Eng.,'33	Washington, D.C.
Thomas, George Washington	Bus.,'30	Plymouth
Thomas, John	C.E.,'31	Pottsville
Thomlinson, Matthew	Arts,'32	Bethlehem
Thompson, Clarence Thomas	Bus.,'31	Morristown, N.J.
Thompson, Harry Louis	Bus.,'31	Montoursville
Thompson, Hoover	Eng.,'33	Canton, O.
Thompson, Robert Farquharson	Bus.,'31	Bethlehem
Thorne, Albert Monforte, Jr.	Phys.,'32	Richmond Hill, N.Y.
Thornton, Arthur William, Jr.	Met.,'31	McKeesport
Throckmorton, James Sansbury, III	C.E.,'32	Caldwell, N.J.
Ticehurst, William Harry	E.M.,'31	Shrewsbury, N.J.
Tichenor, Harold Wade	Eng.,'33	Maplewood, N.J.
Tiedeken, Theodore John Walton	C.E.,'31	Camden, N.J.
Tiefenthal, Herbert Milton	Bus.,'33	New York, N.Y.

Tilles, Herman Martin	Arts,'32	Jamaica, N.Y.
Tillinghast, Frederick William	C.E.,'30	Baltimore, Md.
Timmons, Morris Massey	C.E.,'32	Ocean City, Md.
Todd, James Scott, III	Bus.,'33	Swarthmore
Toeplitz, William Richard	Met.,'31	Irvington, N.J.
Tomb, Charles Emerson	Eng.,'33	Coopersburg
Tomlinson, Walter John, Jr.	Ch.E.,'31	Arlington, N.J.
Tonkonogy, Andrew Edison	Arts,'32	Brooklyn, N.Y.
Toth, Stephen Bella	Arts,'30	Bethlehem
Towers, William Lindsay	Eng.,'33	South Orange, N.J.
Towle, Joseph Walter	Arts,'31	Potosi, Mo.
Townend, Russell Parks	Eng.,'33	Fitchburg, Mass.
Townsend, Frederick Snow	Eng.,'33	New Haven, Conn.
Trabulsi, Kalil Paul	Bus.,'32	Brooklyn, N.Y.
Traeger, Charles Henry, Jr.	M.E.,'30	Rock Island, Ill.
Trost, Henry John	M.E.,'31	Union City, N.J.
Tucker, Frank Philip	M.E.,'30	Bernardsville, N.J.
Tull, Richard	C.E.,'30	Fanwood, N.J.
Tunick, Arthur Mandel	Arts,'30	New York, N.Y.
Tunick, Milton Gordon	Arts,'31	New York, N.Y.
Turn, George Boyer	Bus.,'31	Binghamton, N.Y.
Tuttle, Norman Judd	Arts,'33	Upper Montclair, N.J.
Twiggar, Edward Vernon	C.E.,'31	Shamokin
Uhrich, Morris Bordner	Eng.,'33	Myerstown
Ullman, Gerald Wood	Arts,'32	Reading
Underwood, Erwin Frederic	Arts,'31	Newport, R.I.
Vaccaro, Antonio Roberts	Eng.,'33	Allenhurst, N.J.
Valentine, Weston Wightman	E.E.,'31	Kensington, Md.
VanBlarcom, Samuel Robert	E.E.,'30	Midland Park, N.J.
VanBuskirk, Roger Barnes	Bus.,'33	Detroit, Mich.
Vandegrift, William B., Jr.	Bus.,'32	Burlington, N.J.
VanderHorst, Elias, Jr.	Eng.,'33	Baltimore, Md.
VanDusen, George Cross, Jr.	M.E.,'31	Excelsior, Minn.
VanGilder, Burrows Corson	Eng.,'33	Petersburg, N.J.
VanHorn, Emery Lamartine	C.E.,'32	Sayre
vanHorn, Frank John	Eng.,'33	Scranton
VanKirk, William Keenan	Eng.,'33	Elizabeth
VanLoan, Morton, Jr.	Bus.,'32	Albany, N.Y.
Vannatta, Richard Weston	Arts,'32	Bethlehem
VanRees, Wilson	Bus.,'33	Freeport, N.Y.
Vaughan, George Chandler	C.E.,'30	Washington, D.C.
Veale, Frank Read, Jr.	Arts,'31	Glenside
Vennum, Robert Riddell	Eng.,'33	Wilmington, Del.
Voit, Edward William	Eng.,'33	Warren, O.
Voss, Henry Alfred	Bus.,'33	Brooklyn, N.Y.
Vreeland, Everett	Eng.,'33	Towaco, N.J.
Vroman, Guy Marston	Bus.,'30	Larchmont, N.Y.
Vroom, William Henry	E.E.,'30	Ridgewood, N.J.
Wachholtz, Walter A.	Ch.E.,'32	Hasbrouck Heights, N.J.

Wagner, William Herman	Met.,'31	Milwaukee, Wis.
Wainright, Henry Vedder	Eng.,'33	Manasquan, N.J.
Wainright, Walter Scott	Eng.,'33	Mansfield, O.
Walbert, David Eugene	E.E.,'30	Allentown
Wall, Robert Bates	Eng.,'33	Chattanooga, Tenn.
Wallace, Jack David	Arts,'32	New York, N.Y.
Walker, Harry Samuel	Eng.,'33	West Chester
Walsh, Joseph Russell	E.M.,'31	Somerville, N.J.
Walter, Alexander Ernest	I.E.,'32	Montclair, N.J.
Walter, Paul Silas	Bus.,'33	Scranton
Walters, Sydney Delwin	Arts,'30	Trenton, N.J.
Waltman, Moses Richard	Arts,'31	Brooklyn, N.Y.
Wanner, Louis Raimond	E.E.,'31	Philadelphia
Ward, Robert Davis	C.E.,'32	Brooklyn, N.Y.
Wardle, Howard	C.E.,'30	Philadelphia
Ware, Allen Theodore	Bus.,'32	Glassboro, N.J.
Warendorf, Harry II	Bus.,'33	Hollis, N.Y.
Warner, William Chamberlain	Arts,'32	Montrose
Warnick, Clarence Don	Ch.E.,'32	Washington, D.C.
Warren, Walter Burgess, Jr.	Bus.,'31	West Newton, Mass.
Warren, William Bradford	Eng.,'33	Westfield, Mass.
Warwick, William Bond	C.E.,'31	Upper Darby
Waterman, John Anderson	I.E.,'30	Pittsburgh
Watters, John Waldner	Arts,'30	Ashland
Weaver, Carl Augusta	I.E.,'32	Oradell, N.J.
Weaver, Paul Lawrence	Arts,'30	Dryden, N.Y.
Weber, William H. A., Jr.	Ch.E.,'32	Maplewood, N.J.
Webster, William Henry Clothier	Eng.,'33	Philadelphia
Weil, Harold Bachman	Bus.,'32	Youngstown, O.
Weimar, Paul John	I.E.,'31	Philadelphia
Wein, Ellis	Bus.,'31	New York, N.Y.
Weiner, Alex Edward	Eng.,'33	Brooklyn, N.Y.
Weinstock, Harold Judas	Arts,'32	Brooklyn, N.Y.
Weiss, Clarence Carl	Ch.E.,'31	Scranton
Weiss, Edward Haring	E.E.,'30	Allentown
Weldon, Robert George	Eng.,'33	Mount Vernon, N.Y.
Wentz, Charles Robert	Met.,'30	Duquesne
Wentzel, John Mark	M.E.,'32	Carlisle
Werft, August Rudolph	E.M.,'32	Altoona
Werley, Edwin Penrose	Bus.,'30	Allentown
Werner, Joseph Charles, Jr.	Ch.E.,'30	Hasbrouck Heights, N.J.
Werner, Thomas Odenweller	Eng.,'33	Bangor
Wert, James VanAtta	Ch.E.,'31	Hackettstown, N.J.
Wesner, Ralph	C.E.,'31	Pottstown
Weysser, John Louis Gallus	E.M.,'32	Paxinos
Whims, Paul Laurence	E.M.,'31	St. Clair
White, Roland Stedman	Bus.,'31	Suffield, Conn.
Whitehead, Ross	M.E.,'31	Pawtucket, R.I.

Whitehead, Stevenson Burke	Bus.,'33	New York, N.Y.
Whitenight, Harvey Aurand, Jr.	Chem.,'32	Allentown
Whitney, Forrest Jerome, Jr.	E.E.,'30	Philadelphia
Whitney, Myron Edward	Eng.,'33	Philadelphia
Widdowfield, Arthur Samuel	Eng.,'33	Scranton
Widger, Duane Lloyd	Eng.,'33	Scranton
Wiegner, James Robert	Ch.E.,'31	Bethlehem
Wiehe, Theodore Baird	Arts,'33	New York, N.Y.
Wiener, Robert Louis	Arts,'30	New York, N.Y.
Wilde, Norton Charles	C.E.,'31	New York, N.Y.
Wilkinson, Donald Elverson	Bus.,'31	Meriden, Conn.
Willenbecker, James Frederick	Eng.,'33	Allentown
Williams, Donald Correll	Eng.,'33	Bangor
Williams, John Geyer	Eng.,'33	Bethlehem
Williamson, John Louis	I.E.,'32	Miami, Fla.
Willis, Richard Lewis	Eng.,'33	Bethlehem
Wills, Walter Pennypacker	E.E.,'30	Philadelphia
Wilson, Harry Stephen	Eng.,'33	Brooklyn, N.Y.
Wilson, Lloyd Garrison	Arts,'30	New York, N.Y.
Wilson, Robert James, II	Bus.,'33	Merion
Wilson, Stanmore VanNess	Eng.,'33	East Orange, N.J.
Winkler, David Waldemar	Ch.E.,'32	Bethlehem
Wise, Franklin Bratt	Eng.,'33	Dover, Del.
Wisner, Edwin Reinhold	Eng.,'33	Sewickley
Witemeyer, Benton Diehl	Ch.E.,'32	Bethlehem
Withrow, William Edgar	Eng.,'33	Manasquan, N.J.
Wittmer, Henry	Arts,'32	Pittsburgh
Wolf, Edwin Adolph	Ch.E.,'32	Narberth
Wolfe, Theodore Allen	E.E.,'31	Elmhurst
Wolff, James Patterson	Bus.,'33	Waynesboro
Woll, Carl Richard	Chem.,'30	Philadelphia
Woltemate, Albert William, Jr.	Bus.,'32	Philadelphia
Wood, Adriance Howland	Ch.E.,'32	New Rochelle, N.Y.
Wood, Howard Dalton	Bus.,'31	Wilmington, Del.
Woods, Charles Thompson	Eng.,'33	Toronto, Ont., Canada
Woodward, John Detwiler	E.E.,'30	Bala-Cynwyd
Wooley, Joseph Addison, Jr.	Bus.,'32	Forest Hills, N.Y.
Worthington, Edward Hedden, Jr.	Eng.,'33	East Stroudsburg
Wright, Donald Lynd	M.E.,'30	Philadelphia
Wyckoff, Barkley, Jr.	Bus.,'33	Glen Ridge, N.J.
Wyckoff, Fred Albert, Jr.	Arts,'31	New York, N.Y.
Wynkoop, William	E.E.,'30	Scranton
Yaffe, Charles	Bus.,'33	Reading
Yates, George Latham	Eng.,'33	Bartlesville, Okla.
Yocum, Robert Curtis	I.E.,'31	Shamokin
Yosko, Ervin Francis	Arts,'33	Bethlehem
Young, Milton Gabriel	Phys.,'32	Coopersburg

Young, Paul Oscar	Phys.,'32	Kingston
Young, William Alson	Eng.,'33	Coopersburg
Young, William Cope	Eng.,'33	East Orange, N.J.
Youngblood, Robert Nixon	Eng.,'33	Wilkes-Barre
Youngken, Henry Christian	E.E.,'30	Bethlehem
Youngman, William Airey	Eng.,'33	Hazleton
Zabriskie, Frederick Nathaniel	Arts,'31	North Hackensack, N.J.
Zabriskie, Harold Benedict	Eng.,'33	North Hackensack, N.J.
Zakorka, Zigman Walter	E.M.,'31	Scranton
Zaretzki, Leon	Arts,'32	Yonkers, N.Y.
Zearley, James Paul	C.E.,'30	Uniontown
Zeaser, John Edward	E.E.,'30	Catasauqua
Zeigler, Albert Howard	Ch.E.,'30	Norristown
Zenitz, Julian Leon	I.E.,'31	Baltimore, Md.
Zimmer, Harry John	M.E.,'30	Philadelphia
Zipser, James Alexander	C.E.,'30	New York, N.Y.
Zitserman, Peter Jacob	Arts,'33	Providence, R.I.
Zevitz-Siebert, Walter Hermann	Eng.,'33	Coopersburg
Zoble, Robert	Arts,'31	Trenton, N.J.
Zonge, Randolph Daniel	Ch.E.,'32	Williamsport
Zorbas, Charles Francis	Bus.,'33	Easton

SPECIAL STUDENT

Holland, Herbert	Arts,	Easton

SUMMER SESSION, 1929

Abrahams, Sylvan	Brooklyn, N.Y.
Achenbach, Helen Clarissa, A.B. (*Cedar Crest College*)	Bethlehem
Adams, Stanley Benning	Saginaw, Mich.
Adams, William Brackenridge	Crafton
Adolph, Alfred Carldon	Easton
Allison, Samuel Deane	Allentown
Altland, Frederick Henry	Abbottstown
Anderson, Archibald MacGregor, Jr.	Brooklyn, N.Y.
Anderson, John Buchanan Robinson	New York, N.Y.
Anderson, Judith	Bethlehem
Anderson, Robert Lee	Worcester
Andrews, Harry, Jr.	Walnutport
Antoniotti, John James	Union City, N.J.
Arrott, Albert Edward, Jr.	Pittsburgh
Arthur, William Leighley	Pittsburgh
Ayre, Thomas, Jr.	Miner's Mills
Badgley, William Gervaise, Jr.	Chatham, N.J.
Baird, Robert Ligget, Jr.	Lansdowne
Baldwin, Armand Raphael	Lansford
Barres, Herster	Bethlehem
Barres, Jeanette, B.A. (*Wellesley College*)	Bethlehem
Baur, Albert Campbell	Bethlehem
Beaver, Donald Payne	Bethlehem
Bennetch, Leonard Muhlenberg	Lebanon
Bennett, William Ogle, Jr.	Lancaster
Berger, Vincent Paul	Aberdeen Proving Ground, Md.
Best, Daniel Elwert	Stanhope, N.J.
Bienfang, George John	Linden, N.J.
Billman, Leroy Stanley	Landisburg
Bindley, John	Pittsburgh
Bingham, Melville Comstock	Rome, N.Y.
Bird, William Eric	Birmingham, Eng.
Black, Raymond Philip	Newark, N.J.
Blackwell, Warren Allen	Titusville, N.J.
Bock, Louis	Bethlehem
Bollman, John Adam	Lebanon
Bond, Charles Vernon	Coral Gables, Fla.
Boyd, Earl James	Dumont, N.J.
Boyd, James Daskin, Jr.	Bayonne, N.J.
Boyd, Robert Putnam	Staten Island, N.Y.
Boyer, Harry Jeremiah	Egypt
Braun, Robert Carl	Reading
Brewer, John Gilmore	Pittsburgh
Britton, Lawson Valentine, Jr.	Scranton

Bronstein, Jesse Bayliss, Jr.	Allentown
Brooks, Leonard	Philadelphia
Brower, Theron Emmet	Little Silver, N.J.
Brumbach, George Edward	Esterly
Buchanan, William Christian	Philadelphia
Buckler, Edward St. Clair, Jr.	Baltimore, Md.
Burns, Hugh Francis	Catasauqua
Busch, Herbert Hertgen	Newark, N.J.
Canonico, Stephen	Red Bank, N.J.
Carranza, William	Habana, Cuba
Casselman, Howard Frederick	South Orange, N.J.
Castellano, Nicholas Ilaria	Newark, N.J.
Chandler, Libert Theodore	Bethlehem
Ciaskewicz, Arthur Joseph	Hackettstown, N.J.
Citron, Millard Herman	White Plains, N.Y.
Clark, Robert Curtis	Pittsburgh
Clarke, Jess Fellows	New York, N.Y.
Cleaver, Thomas Stevens	Reading
Clocker, Edwin Thompson	St. Clair
Coe, Edwin Merritt	Suffern, N.Y.
Cohn, Leslie McKinley	New York, N.Y.
Collins, James Vallance	Rome, N.Y.
Collins, Joseph Gerard	Scranton
Cook, Alonzo Edward	New York, N.Y.
Cooper, George Ellsworth	Coopersburg
Cordova, Felix Lope	Porto Rico
Crispen, Hibberd Reese	Harrisburg
Crocco, Samuel Robert	Weedville
Cronin, John Howard	Yorklyn, Del.
Cunningham, Frederick Noel	Bethlehem
Cuntz, William Cooper	Kew Gardens, N.Y.
Cupaiuoli, Richard Anthony	Woodcliff, N.J.
Current, Watson Edward	Belleville, N.J.
Cyphers, Elmer Benjamin	Bethlehem
Dakin, Robert Calvin	Scranton
Davey, John Roderick	Mansfield, O.
Davidson, Coolidge, Jr.	Montclair, N.J.
Davies, Rosa Ellen, B.S. in Ed. (*Temple University*)	Bethlehem
Davis, Alfred Jeremy	Scranton
Davis, David	Freeport, N.Y.
Davis, Philip Smyser	Lebanon
DeBerardinis, Vincent Anthony	Chester
Decker, Robert Benjamin	Elizabeth, N.J.
Deutschman, Manuel	Easton
Dew, James Harry, B.S. (*Muhlenberg College*)	Easton
Douglas, Edward Braislin	Plainfield, N.J.
Dow, James Neal	Philadelphia
Drake, Herbert Ernest	East Orange, N.J.

Dreyer, Herman Andrew	Freehold, N.J.
Drukker, Raymond Henry	Passaic, N.J.
Duncan, Arno Lee Roy, Jr.	Shillington
Earhart, Kenneth Allen	Avonmore
Earich, Arlene Elizabeth	Bethlehem
Elliott, Henry Burns	Lansdowne
Elly, Robert Duncan	Elizabeth, N.J.
Elmore, William Cronk	Montour Falls, N.Y.
Engel, John Augustine	Stamford, Conn.
Engle, William Oliver	Scottdale
Epstein, Edward	Easton
Erb, Albert Schmidt, B.S. (*Muhlenberg College*)	Easton
Everett, William Henry, Jr.	Bethlehem
Evers, Eben Francis	East Aurora, N.Y.
Eyster, William Myers, III	York
Fader, William Lewis, Jr.	Sewickley
Fairchild, Matthew Gilbert	Monterrey, N.L,. Mex.
Faust, Henry Joseph	Catasauqua
Fegely, Alvin Nathan, B.S. (*Franklin and Marshall College*)	Maxatawny
Fenstermacher, Guy Marvin, B.A. (*Lehigh University*)	Telford
Feucht, Robert	Lambertville, N.J.
Fezell, William Henry	Beaver
Fisher, Carl Landis	Waynesboro
Fisher, Frank Lynn	Pottsville
Fluck, Roger Illick	Bethlehem
Foering, Howard Augustus, Jr.	Bethlehem
Foley, William Romig	Allentown
Folwell, Charles Edmund, Jr.	Allentown
Folwell, John Davies	Allentown
Forsyth, Henry James	Buffalo, N.Y.
Frace, John William	Easton
Fralick, Ralph Stoddart	New York, N.Y.
Freeman, Leona, B.S. (*Temple University*)	Nazareth
Freese, Frank Bernard	Lyndhurst, N.J.
Friedrick, Ferdinand LaRue	Hawthorne, N.J.
Fritts, James Anthony	Phillipsburg, N.J.
Frutiger, Thomas William	Red Lion
Fryling, Henry Heyward, Jr.	South Orange, N.J.
Fuller, James Osborn	Bethlehem
Fuller, Samuel Cassedy	Pittsburgh
Fulmer, John Edward	Bethlehem
Furman, William Amies, Jr.	Trenton, N.J.
Gaffney, Rose Marie	Bath
Gamble, William John	Allentown
Geary, Daniel Henry	Springfield, Mass.
Gibbs, Wilbur Mercer	Yardley

Gilbert, Roswell Ward	Brooklyn, N.Y.
Girtanner, Robert Edward	Elizabeth, N.J.
Glace, Kenneth William	Bethlehem
Goehring, William Henry, Jr.	New Brighton
Goldsmith, Emil Schott	Bernardsville, N.J.
Goldstein, Israel Payson	East Taunton, Mass.
Goodman, Samuel Ben	Bethlehem
Goodman, Samuel Harry	Bethlehem
Gormley, Edward Martin	Hazleton
Grauer, Bernard	New York, N.Y.
Graziani, Orlando	Parli, Italy
Grebinger, John Kauffman	Millersville
Green, William Jennings	Baltimore, Md.
Greiner, Earl Shirk, B.S. in Met. E. (*Carnegie Institute of Technology*)	Lebanon
Grinevich, Joseph John	Mahanoy City
Groman, Henry Newton	Bethlehem
Haas, Manfred Jacques	New York, N.Y.
Hall, Samuel Lindsay	Hackensack, N.J.
Hallock, Hadley Alden	Palmerton
Hancock, Esther Elizabeth	Easton
Hansen, Christian Leonard	Brooklyn, N.Y.
Harris, Samuel Laurence	Washington, D.C.
Harrower, Wilbur Parkhurst	Plainfield, N.J.
Hartman, Paul	New York, N.Y.
Harwood, Thomas James, Jr.	East Islip, N.Y.
Hay, Elizabeth Baer, B.A., B.S. (*Hood College, Drexel Institute*)	Bethlehem
Hays, John Henderson	Montclair, N.J.
Hemingway, Ellsworth Lowel	Bridgeport, Conn.
Hemphill, Charles Williams	Philadelphia
Henry, Michael Joseph	Bethlehem
Herbert, George William, Ph.B. (*Muhlenberg College*)	Allentown
Herbert, Mary Elizabeth, Ph.B. (*Muhlenberg College*)	Allentown
Hersberger, Marshall Davis	Sellman, Md.
Hess, Aaron Elwood	Lancaster
Hess, Richard Samuel	Bethlehem
Hildum, Edward Barkdoll	Plainfield, N.J.
Hillson, Raymond Henry	Brookline, Mass.
Hindson, Theodore Phillip	Freeland
Hinkle, Harold Eugene	Bethlehem
Hoehn, Walter George	Bogota, N.J.
Holahan, John James	Reading
Hoover, Marcus Lacer	Pottstown
Horne, Arthur Welch	Plainfield, N.J.
Hottinger, Edwin Jack	Kenvil, N.J.
Hough, Gertrude Avis	Bethlehem
Houston, James Homer	West Grove

Hull, Carl Firman	East Orange, N.J.
Hunoval, Joseph Andreas	Irvington, N.J.
Huntington, Levin Baker, Jr.	Annapolis, Md.
Hurley, Richard Wilton	Belmar, N.J.
Hutchins, William Joseph	East Orange, N.J.
Hutchinson, George Cass, Jr.	Sewickley
Issel, William Ernest	Philadelphia
Jackel, William John	McKeesport
James, William Scott	East Orange, N.J.
Jampol, Warren Sidney	New Rochelle, N.Y.
Jeanson, Charles August, III	Brooklyn, N.Y.
Jeffries, Joseph, Jr.	Hollis, N.Y.
Jennings, Burgess Hill, B.Eng.M.S. (*Johns Hopkins University, Lehigh University*)	Baltimore, Md.
Jensen, Cyril Dewey, B.S. in C.E. (*University of Minnesota*)	Bethlehem
Job, Frederick Dwight	Scranton
Johnson, Albert Cronquist	Bridgeport, Conn.
Johnson, Austin Harry	Highlands, N.J.
Jones, Frank Addison	Washington, D.C.
Jones, Robert Duggan	Kingston
Justice, Preston Gould	Bethlehem
Kachel, Gerald Joseph	Reiffton
Kaleda, George Martin	Mahanoy City
Kane, George Denis, Ph.B., A.M. (*Lafayette College*)	Phillipsburg, N.J.
Kantner, Ogden Austin	Cresskill, N.J.
Kaplan, Morris Elliot	Hartford, Conn.
Kates, Charles Reginald	Cape May Court House, N.J.
Kehoe, John Edward	Bethlehem
Kellett, William Platt, Jr.	New York, N.Y.
Kellner, Theodore Robert	Drexel Hill
Kelly, William Dunham, II	Philadelphia
Kise, Mearl Alton	Allentown
Kistler, Horace Oscar, B.S. (*Muhlenberg College*)	Allentown
Knauss, Roy Alton	Emaus
Knecht, George Lee	Newark, N.J.
Knecht, John Elmer	Collingswood, N.J.
Kriebel, Henry August	Allentown
Krone, Robert	Hackensack, N.J.
Lamb, Elias Morton, Jr.	Natalie
Land, Sidney	Brooklyn, N.Y.
Langhaar, Henry Louis	Allentown
Laubach, Benjamin William, B.S. (*Muhlenberg College*)	Catasauqua
Laws, Llewellyn, Jr.	Philadelphia
Leach, John Frederick	Reading
Leader, John Richard	Shamokin

Leeds, Charles Frederick Alfred	Bethlehem
Lehr, Clarence	Glendale, N.Y.
Leibert, Arthur Lancaster	Bethlehem
Lembeck, Paul Joseph	Summit, N.J.
Lentz, Robert Pierce, Jr.	Eggertsville, N.Y.
Leraris, Dominic	Bangor
Letowt, Zigmont Joseph, Jr.	Hazleton
Levitz, Jacob	New York, N.Y.
Liever, Samuel	Reading
Lilley, Albert Davies, Jr.	Elizabeth, N.J.
Lilly, Helen Mary	Bethlehem
Lippincott, Clement Hysler, Jr.	Wilmington, Del.
Lipstein, Arthur	Newark, N.J.
Long, Melvin LeRoy	Muncy
MacAdam, David Lewis	Upper Darby
MacDonald, Howard Graeme	New York, N.Y.
Mango, Wilfred Gilbert	Woodcliff, N.J.
Marks, Charles Edwin, Jr.	Yonkers, N.Y.
Marks, David, Jr.	Newark, N.J.
Mason, William Daniel, Jr.	Wallingford
Mathisen, George Shimer	Philadelphia
Maylott, Carleton Francis, B.S. in E.E. (*Worcester Polytechnic Institute*)	Derby, Conn.
Mayo, Robert Bass	Takoma Park, D.C.
McCarthy, Frank Joseph, Jr.	Bethlehem
McCrea, Edward James	Passaic, N.J.
McGarrity, William Fisher	Youngstown, O.
McLean, Harry Laurance	Scranton
McLernon, Joseph Francis	Bethlehem
Mealey, William Francis	Allentown
Mears, Harry Albert	Greensburg
Mertz, John Clewell	Allentown
Metzger, Dorothy Fretz	Allentown
Metzger, Malcolm Thomas	Bethlehem
Meyers, Edwin Truman	Red Lion
Millelot, Leon Sylvester	Lyndhurst, N.J.
Miller, Carl Andrew	Staten Island, N.Y.
Miller, Donald	Scranton
Miller, Dorothy Devorah	Bethlehem
Miller, Dustin Yach	Lyndhurst, N.J.
Milson, Charles Alfred	Catasauqua
Minsker, John Henry	East Aurora, N.Y.
Mochamer, Thomas Richard	Centralia
Monroe, Stuart Alexander	Hazleton
Montenecourt, Jean Antoine	Cranford, N.J.
Moore, William Joe	Birmingham, Ala.
Moorhead, Herman Alexander	Buffalo, N.Y.
Morgan, Robert Vincent	Bethlehem
Morhart, Frederick Henry	Washington, D.C.
Morris, Francis Maylum	Lansdale

Mosesco, Philippus, B.A. (*Muhlenberg College*)	Allentown
Moyer, George Weldon	Souderton
Moyer, Willard Mohr, B.S. (*Ursinus College*)	Quakertown
Muendel, Harold John	Woodcliff, N.J.
Mumford, Charles Edward, Jr.	Willards, Md.
Murray, Francis Aloysius	New Haven, Conn.
Myra, Allen Esekeil	Lunenburg, N.S.
Narzisi, Filadelfio	Bethlehem
Nass, Joel, B.A. (*University of Pennsylvania*)	Allentown
Nassau, Charles Francis, Jr.	Philadelphia
Neudoerffer, Albert Lewis	Phoenixville
Neumann, George Julius	Allentown
Newell, William Ellsworth	Somerville, N.J.
Newhard, Henry Thomas	Fullerton
Nicholas, Dorothy Louise, A.B. (*Hood College*)	Allentown
Niehaus, Raymond Martin	East Orange, N.J.
Nolen, James Elmer	Philadelphia
Nora, Thomas Edward	New Brunswick, N.J.
Obert, Horace Dickinson	Lehighton
O'Brien, Robert Lee, Jr.	Washington, D.C.
O'Hora, Joseph Francis, Jr.	Scranton
Oldham, John Edwin	Greenwich, Conn.
Oplinger, Arthur John Griffith, Ph.B. (*Muhlenberg College*)	Walnutport
Oppenheim, Miles Auranus	South Orange, N.J.
Ousey, Harry Haley	Philadelphia
Owens, Laura Thorman	Easton
Papa, Joseph Charles	Philadelphia
Parsons, John Leonard	Troy
Pearre, Oliver Jackson	Baltimore, Md.
Pflaumer, Arthur Eugene	Philadelphia
Phillips, Robert Wilgus	Bayonne, N.J.
Pimper, Charles William, Jr.	Chevy Chase, Md.
Pinkney, Oliver Brayton	Montclair, N.J.
Port, William VanScoyoc	Bywood
Post, Alfred Philip, Jr.	Philadelphia
Pratt, Stanley Winter	Nanticoke
Publicker, Theodore	Philadelphia
Raring, Robert Holland	Harrisburg
Rawn, Andrew Bryson, Jr.	Huntington, W.Va.
Reed, George Douglas	Baltimore, Md.
Reese, Harold	Scranton
Reynolds, Peter Graham	Bethlehem
Ricapito, Joseph	Bethlehem
Riley, George Hempstead	Hagerstown, Md.
Rinker, Kenneth Keiser	Catasauqua

Ritter, Stewart Elwood, Jr.	Allentown
Robar, Henry John	Bethlehem
Robson, Charles Howard	Lansdowne
Roe, Donald Wilson	Newark, N.J.
Rogers, Alfred Nathan	Reading
Rohrs, Arthur George	Ridgewood, N.J.
Rosen, Louis	Baltimore, Md.
Rosencrans, Charles Arthur	Warwick, N.Y.
Rossum, Lee Samuel	Brooklyn, N.Y.
Rubin, Stanley Seymoure	New York, N.Y.
Rudolph, Russell Doverspike	Kittanning
Ruggles, Harry Wyndham, Jr.	Kingston
Rust, George Mooar	Birmingham, Ala.
Sachs, Isabel Eva	Bethlehem
Samuels, Bernard Edwin	Brooklyn, N.Y.
Satter, William Victor	Little Silver, N.J.
Saunders, Henry Kerr	Newark, N.J.
Savage, Rufus Llewellyn, Jr.	Asbury Park, N.J.
Sawyer, John Sherman	Bethlehem
Schantz, Richard Geisel	Allentown
Schermer, Isadore	Bethlehem
Schier, Carl Frederick, Jr.	Ellicott City, Md.
Schneck, Karl Roy	Allentown
Schoen, George Lloyd	Detroit, Mich.
Schoffstall, Charles Foster, Ph.B. (*Muhlenberg College*)	Pottsville
Schrader, Kathryn Marie	Bethlehem
Schrope, Gus Sylvester, B.S. (*Muhlenberg College*)	Allentown
Schuck, William Mitchell	Philadelphia
Schultz, Max	Philadelphia
Schuyler, Elmer VanNess	Upper Darby
Schwartz, John Francis	Allentown
Schwenk, Walter Louis, Jr.	Allentown
Scott, Frank Rutter, Jr.	Glenside
Seabrook, Charles Courtney	Bridgeton, N.J.
Sedam, Oscar Whitson, B.S. in Econ. (*University of Pennsylvania*)	Allentown
Seeburger, William	Philadelphia
Sellers, George Ernest, Jr.	Bethlehem
Serfass, Raymond Koch	Pottsville
Seward, Harold Aloysius	Parkersburg, W.Va.
Shafer, Beatrice Emma, A.B. (*Ursinus College*)	Lehighton
Shankweiler, Ray Gernert	Allentown
Shaw, Franklin Bolton	Swedesboro, N.J.
Shay, Felix Buckley	Baltimore, Md.
Sheen, Robert Tilton	Philadelphia
Shenton, Dean Amandus	Slatington
Sherer, Arthur Milton, Jr.	Noble

Shimer, Stewart Applegate, Jr.	Bethlehem
Sickler, Richard Charles	Wilkes-Barre
Sievering, Howard	Maplewood, N.J.
Simcoe, William Henry	Trenton, N.J.
Simon, Stanley Emanuel	Seaford, Del.
Simpson, William Carl	Columbia, N.J.
Small, Geraldine Genevieve	Catasauqua
Smith, Arthur Levern	Coatesville
Smith, Francis Gerecke	Newburgh, N.Y.
Smith, Harry Auner	Brigantine, N.J.
Smith, Jack Warren	Warren, O.
Smith, James Andrew, Jr., B.S. (*Lafayette College*)	Phillipsburg, N.J.
Smith, Melchior Harry	Columbus, O.
Smith, Robert Clifford, Jr.	Shawnee
Smits, Rivene Oscar Ferdinand	Santiago, Chile
Snyder, Edwin Oscar	Wyomissing
Sones, William Lloyd	Pottsville
Steidle, William Jacob, B.A. (*Lehigh University*)	Jeddo
Steinmetz, Richard Carlton, A.B., M.A. (*Muhlenberg College, Indiana University*)	Allentown
Stem, Edgar Samuel, Jr.	Alderson
Stephenson, Jacob William, Jr.	Tarentum
Stewart, Frederick Fitzgerald	Tuxedo, N.Y.
Stoneback, Ira Townsend	East Orange, N.J.
Storm, Thomas Franklin	Pottstown
Stotz, Vincent Gradwohl	Easton
Stoughton, Mrs. Bradley	Bethlehem
Strauss, Morton	Philadelphia
Stutz, Frank August	Washington, D.C.
Swanger, Walter Abram	Lebanon
Swoyer, Robert Howard	Hazleton
TenEyck, Hugh Skillman	Somerville, N.J.
TenEyck, William Worley	Washington, D.C.
Thatcher, Samuel Harold	Bethlehem
Thomas, Albert Paulding	Flushing, N.Y.
Thompson, Robert Farquharson	Bethlehem
Throckmorton, James Sansbury, III	Caldwell, N.J.
Ticehurst, William Harry	Shrewsbury, N.J.
Tichenor, Harold Wade	Maplewood, N.J.
Tiedeken, Theodore John Walton	Camden, N.J.
Tomlinson, Walter John, Jr.	Arlington, N.J.
Traeger, Charles Henry, Jr.	Rock Island, Ill.
Transue, William John, B.S. (*Moravian College*)	Catasauqua
Trjitzensky, Mrs. Waldemar J.	Bethlehem
Troderman, David	Dorcester, Mass.
Trost, Henry John	Union City, N.J.
Ullman, Gerald Wood	Reading

Unger, Louis Frank	Allentown
Valentine, Weston Wightman	Kensington, Md.
VanHorn, Emery Lamartine	Sayre
VanKuren, Edwin, B.A. (*Lehigh University*)	Lebanon
Voit, Edward William	Warren, O.
Vroman, Guy Marston	Larchmont, N.Y.
Wallace, William Carson, A.B. (*Lafayette College*)	Greensburg
Walsh, Joseph Russell	Somerville, N.J.
Walter, Alexander Ernest	Montclair, N.J.
Ward, Ralph Eugene, Jr.	Dalton
Waterman, John Anderson	Pittsburgh
Watters, John Waldner	Ashland
Weierbach, Russell Mason, B.A. (*Lehigh University*)	Pleasant Valley
Weaver, Carl Augusta	Oradell, N.J.
Weber, William H. A., Jr.	Maplewood, N.J.
Weiss, Clarence Carl	Scranton
Werft, August Rudolph	Altoona
Wert, James VanAtta	Hackettstown, N.J.
Whitehead, Ross	Pawtucket, R.I.
Whitehead, Stevenson Burke	New York, N.Y.
Wiegner, James Robert	Bethlehem
Wigham, James Lind	Easton
Williamson, John Louis	Miama, Fla.
Wilson, Robert James, II	Merion
Wilson, Stanmore VanNess	East Orange, N.J.
Winkler, David Waldemar	Bethlehem
Wood, Adriance Howland	New Rochelle, N.Y.
Woodring, Grace, B.A. (*Albright College*)	Bethlehem
Wyckoff, John Franklin, B.S. (*Yale University*)	Stroudsburg
Young, Milton Gabriel	Coopersburg
Young, William Alson	Coopersburg
Youngken, Henry Christian	Bethlehem
Zakorka, Zigman Walter	Scranton
Zeigler, Albert Howard	Norristown
Zenitz, Julian Leon	Baltimore, Md.

SUMMARY OF STUDENTS BY CLASSES AND CURRICULA

Undergraduates	Seniors	Juniors	Sophomores	Freshmen	Unclassified	Special Student	Total
Arts and Science	74	66	83	112	1	1	337
Business Administration	58	74	90	151	..	..	373
Chemical Engineering	19	27	41	......	..	..	87
Chemistry	3	3	4	......	..	..	10
Civil Engineering	41	31	31	......	..	..	103
Electrical Engineering	44	29	15	......	..	..	88
Engineering Physics	5	4	12	......	..	..	21
Industrial Engineering	15	13	23	......	..	..	51
Mechanical Engineering	19	21	25	......	..	..	65
Metallurgical Engineering	6	12	19	......	..	..	37
Mining Enginering	3	14	17	......	..	..	34
Freshman Engineering	....	....	....	364	..	..	364
Total	287	294	360	627	1	1	1570

Graduate Students	57
Undergraduates	1570
Students in Summer Session, 1929	449
Total, less duplications	1711

GEOGRAPHICAL DISTRIBUTION OF STUDENTS, 1929-1930

Alabama	3
Arkansas	1
Connecticut	34
Delaware	16
District of Columbia	19
Florida	6
Georgia	2
Illinois	6
Indiana	3
Iowa	1
Kansas	1
Kentucky	1
Maryland	42
Massachusetts	23
Michigan	6
Minnesota	3
Missouri	1
Nebraska	1
New Jersey	310
New York	334
Ohio	18
Oklahoma	1
Pennsylvania	831
Rhode Island	5
South Carolina	1
Tennessee	2
Vermont	1
Virginia	8
West Virginia	10
Wisconsin	4
Wyoming	1
Alaska	1
Brazil	1
Canada	3
Chili	1
Cuba	4
England	1

Italy	1
Mexico	1
Porto Rico	2
Siam	1
Total	1711

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